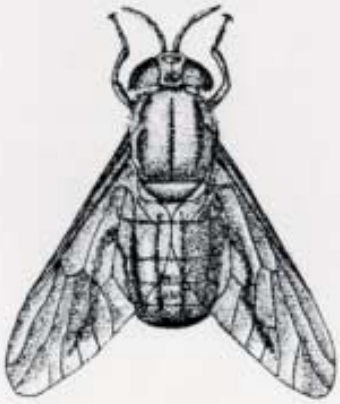
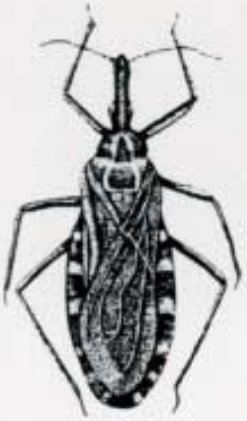
Armed Forces Pest Management Board
Technical Information Memorandum No. 36

A F P M B

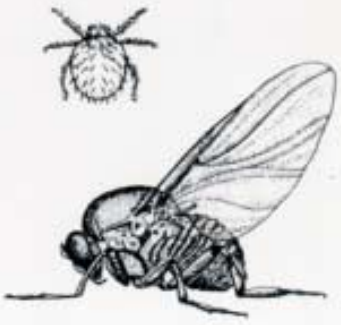


Personal Protective Techniques Against Insects and Other Arthropods of Military Significance







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Washington, DC 20307-5001

Acknowledgements: This Technical Information Memorandum (TIM) No. 36 was adapted from U.S. Army Environmental Hygiene Agency (USAEHA) Technical Guide No. 174 through the efforts of the Armed Forces Pest Management Board (AFPMB) Repellents Committee and the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM). Photographs were provided by Mr. Richard Griffith and Mr. Ben Bunger, USACHPPM, Aberdeen Proving Ground, MD, and Richard Fitzsimons, U.S. Army Medical Activity (USAMEDDAC), Fort Leonard Wood, MO.

TECHNICAL INFORMATION MEMORANDUM NO. 36

PERSONAL PROTECTIVE TECHNIQUES AGAINST INSECTS AND OTHER ARTHROPODS OF MILITARY SIGNIFICANCE

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PERSONAL PROTECTIVE TECHNIQUES AGAINST INSECTS AND OTHER ARTHROPODS OF MILITARY SIGNIFICANCE

1 INTRODUCTION

1-1. Purpose

This Technical Information Memorandum (TIM) provides preventive medicine (PVNTMED) information and guidance to Department of Defense (DoD) personnel who may come into contact with nuisance or disease-carrying arthropods (disease vectors), or who are responsible for protecting the health of such personnel. It describes the DoD Insect Repellent System and other techniques that provide maximum, safe protection from arthropod attack. These techniques include the use of protective clothing and equipment, repellents, pesticides, and other strategies. This TIM is based on, and supercedes, U.S. Army Environmental Hygiene Agency (USAEHA) Technical Guide (TG) No. 174, and Personal Protective Techniques Against Insects and Other Arthropods of Military Significance, June 1991, and the Armed Forces Pest Management Board's (AFPMB) TIM No. 36, Personal Protective Techniques Against Insects and Other Arthropods of Military Significance, August 1996 version.

1-2. References

References are listed in Appendix A.

1-3. Explanation of Abbreviations

Abbreviations used in this TIM are explained in Appendix F- Glossary.

1-4. Suggested Improvements

The proponent agency of this TIM is the Armed Forces Pest Management Board (AFPMB). Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms), or in a document using a similar format, directly to the Defense Pest Management Information Analysis Center (DPMIAC), AFPMB, Forest Glen Section, Walter Reed Army Medical Center (WRAMC), Washington, DC 20307-5001. A pre-addressed form is found in Appendix B.

Use of trademarked names does not imply endorsement by the Department of Defense but is intended only to assist in the identification of a specific product.

1-5. Background

a. Historically, in every war and military conflict, combat power has been reduced more significantly by disease and non-battle injuries (DNBI) than from direct combat casualties. A large number of diseases affecting the troop strength of deployed units is directly attributed to disease-carrying arthropods. Moreover, arthropods can inflict severe physical, psychological, and economic stresses that threaten the military mission. Not only do they transmit disease, but the bites they inflict can be painfully distracting and can lead to devastating secondary infections, dermatitis, or allergic reactions. Further, contamination of food and damage to other commodities are costly.

b. History is replete with examples of how arthropod-borne diseases have significantly impacted military operations.[7,9,13,43]

(1) In 1812, Napoleon invaded Russia with 422,000 men. Within three months, seven of every ten soldiers had fallen to epidemic louse-borne typhus, leaving a force of only 100,000. Cold injuries completed the devastation of the disease-weakened force, and by the time Napoleon's *Grande Armée* retreated out of Russia only 10,000 remained. Dysentary and pneumonia joined with typhus to further reduce the force to fewer than 3,000 living troops.

(2) On the American front, in General George Washington's Continental Army, ten Americans died of diseases for every one who died in battle. In the War of 1812, General Andrew Jackson's victory at the Battle of New Orleans in January 1815 was immediately followed by the death of most of the surviving American and British troops from mosquito-borne malaria. During the Civil War, there was a 2:1 ratio in deaths from disease versus combat. In 1898, Army disease casualties included 90,416 cases of malaria, 1,169 cases of yellow fever and 249 cases of dengue fever, with respective fatality rates of 4, 123, and 8 per 1,000 cases.

(3) During World War I, the ratio of deaths from disease versus combat in U.S. troops improved to 1:1, but there were still 16,930 cases of malaria. During World War II, it is estimated that over 24,000,000 man-days were lost to arthropod-borne diseases. An entire regiment was rendered ineffective by scrub typhus. Dengue fever reached a high of 28,292 cases in the Southwest Pacific with 52 cases per 1,000 troops per year. An outbreak of dengue in the New Hebrides in 1943 affected 26 percent of U.S. forces (more than 6,000 personnel). During the Korean War, U.S. Army forces suffered more than 30,000 cases of malaria, and hundreds of Americans were hospitalized during a 1951 epidemic of Korean hemorrhagic fever. During the Vietnam War, diseases accounted for unheralded annual rates of 56 to 74 percent of all U.S. Army hospital admissions. From 1965 through 1970, the Army lost 2,000,000 man-days to malaria alone. Units operating in the la Drang Valley in 1965 reported an annual malaria rate of 600 cases per 1,000 troops, which rendered two entire battalions ineffective for a time. Annual epidemics of Japanese encephalitis were also devastating.

(4) More recently, in 1993 over 200 cases of malaria were reported among U.S. military personnel who served in Somalia during Operation Restore Hope. Dengue virus infections occurred in military personnel stationed in Haiti as part of Operation Uphold

Democracy in 1994, and cases of leishmaniasis were an outcome of military operations in Central and South America, and the Middle East in the 1990s.

(5) In the United States, tick-borne infections such as Lyme disease continue to take a toll on troops training in areas of the Southeast, Northeast, and upper midwest, while newly emerging infections such as the human ehrlichioses are now posing further hazards. Nuisance arthropod bites and the diseases they transmit will continue to be a serious threat to troops in training and in combat.

1-6. Arthropods of Military Significance

a. Table 1 lists the major arthropod pests of military importance and the primary diseases that they transmit.[7a,64]

(1) In most regions of the world, mosquitoes are the foremost disease vectors and nuisance pests. They transmit three of the most serious vector-borne diseases that jeopardize U.S. forces: malaria, dengue, and viral encephalitis.

(2) Phlebotomine sand flies transmit other major diseases of military importance such as sand fly fever and leishmaniasis.

(3) Additional arthropods that cause disease, nuisance problems, or direct injury, are black flies, deer flies, horse flies, stable flies, tsetses, greenheads, filth flies, bot flies, Tumbu flies, biting midges, fleas, mites, ticks, lice, kissing bugs, bees, wasps, ants, and scorpions.

(a) Ticks can host a broad range of pathogens, including the agents of Lyme disease, Rocky Mountain spotted fever, and the human ehrlichioses.

(b) Although some arthropods, notably filth flies, do not bite and are therefore not true vectors of disease, they can mechanically transmit many serious illnesses such as dysentery, cholera, salmonella, shigellosis, and typhoid fever.[7a] Additionally, they are often numerous enough in many areas to pose an extreme nuisance, constantly seeking moisture from sweat and from fluids of the eyes, nose, and mouth.

(c) Other arthropods that directly cause human injury, but that are also not true vectors of disease, are the bot flies and the Tumbu fly. Larvae (which are also known as maggots) of these flies burrow into human skin and develop in the tissue, causing intense pain and itching.[43] Invasion of tissue by fly maggots is called myiasis.

Table 1. Arthropods of Military Importance and the Major Diseases They Transmit

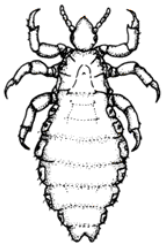
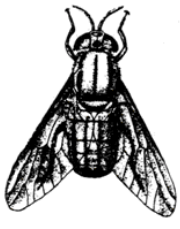
Visual ID	Common Name	Genus	Diseases[7a,45,64]
	**Biting midges**	**Culicoides**	**- Visceral filariasis (mansonellosis)** **- Oropouche fever**
	**Body lice**	**Pediculus**	**- Epidemic typhus** **- Relapsing fever** **- Trench fever**
	**Black flies**	**Simulium**	**- Onchocerciasis**
	**Bot flies**	**Dermatobia**	**- Myiasis**
	**Deer flies**	**Chrysops**	**- Eye worm disease (loa loa)** **- Tularemia**

Table 1. Arthropods of Military Importance and the Major Diseases They Transmit[7a,45,64] (Continued)

Visual ID	Common Name	Genus	Diseases
	**Fleas**	**Xenopsylla**	**- Plague** **- Murine typhus**
	**Kissing bugs**	**Rhodnius, Triatoma, Panstrongylus**	**- Chagas' disease (American trypanosomiasis)**
	**Mites**		
	Chigger mites	**Leptothrombidium**	**- Scrub typhus**
		Sarcoptes	**- Scabies**
	Mouse mites	**Lyponyssoides**	**- Rickettsialpox**
	**Mosquitoes**	**Aedes**	**- Dengue** **- Yellow fever** **- Viral encephalitis**
		Anopheles	**- Malaria**
		Culex, Aedes	**- Viral fevers (Oropouche, Rift Valley, Chickungunya)**
		All three	**- Lymphatic filariasis (Wuchereriasis, Brugiasis)**

Table 1. Arthropods of Military Importance and the Major Diseases They Transmit[7a,45,64] (Continued)

Visual ID	Common Name	Genus	Diseases
	Sand flies	Lutzomyia, Phlebotomus	- Leishmaniasis - Sand fly fever - Bartonellosis
	Ticks		
	Hard ticks	Dermacentor	- Spotted fevers - Colorado tick fever
		Ixodes	- Lyme disease - Babesiosis - Viral encephalitis - Tularemia
		Amblyomma Ixodes	- Human ehrlichioses
		Hyalomma	- Crimean-Congo hemorrhagic fever
	Soft ticks	Ornithodorus	- Relapsing fever
	Tsetses	Glossina	- Trypanosomiasis (African sleeping sickness)
	Tumbu flies	Cordylobia	. Myiasis

1-7. Responsibilities

(1) The human bot fly (Dermatobia hominis) deposits eggs on a second arthropod, usually a mosquito. The eggs hatch as the mosquito feeds, and the larvae then burrow into the human host's skin. The larva develops within the skin of the host for 2-3 months, until it finally emerges and drops to the ground to pupate. The lesions are most frequently seen on unprotected areas of the body, especially the hands, feet, head, and neck. This pest is primarily a threat in tropical America.[43] Use of repellents and mosquito netting at night are important measures to prevent infestation.[45]

(2) The Tumbu fly (Cordylobia anthropophaga) lays eggs on urine-stained, sweat-stained or wet clothing, or urine-soaked earth.[45] Newly hatched larvae then penetrate host skin as they migrate from the clothing or the ground. This fly causes a lesion similar to that of the human bot fly, and is primarily a problem in Africa. The larvae mature in only 8-9 days.[43] Good sanitation to reduce fly populations, ironing clothes to kill any eggs present, drying clothes in screened enclosures, and avoiding soil contact will help prevent infestation.[45]

1-7. Responsibilities

a. Personal protection is an individual responsibility, although it is also an important adjunct to unit-level and higher echelon PVNTMED countermeasures. Military personnel must be aware of the following:

(1) Types of arthropods in an area;

(2) Their habits;

(3) The threat they present;

(4) The resources available for protection;

(5) How to use these resources effectively.

b. **COMMAND EMPHASIS IS ESSENTIAL!** Commanders and medical personnel must monitor compliance with personal protective strategies to ensure that all appropriate protective resources are being provided, and that individuals are using these protective resources properly.[4] FORSCOM (U.S. Army Forces Command) Regulation 700-2[12] **REQUIRES ALL COMPANY AND BATTERY-SIZED UNITS TO PRE-STOCK SPECIFIC QUANTITIES OF THE STANDARD MILITARY SKIN AND CLOTHING REPELLENTS FOR EACH INDIVIDUAL.**[12] It is **IMPERATIVE** that troops have immediate access to sufficient personal protective supplies if they are to be adequately protected upon deployment.

2 METHODS OF PROTECTION

Section I. Introduction

2-1. General

Arthropod-borne diseases and nuisance pests can be prevented or controlled by using a number of techniques including personal protective measures and environmental controls. In many situations, personal protective measures such as avoiding infested areas, or the use of physical barriers or chemical repellents, may be the only means of protection available. Environmental controls, while not a primary focus of this TIM, are nevertheless mentioned to illustrate the total integrated approach that should be employed by a unit in field situations. They include such techniques as sanitation, mechanical and behavioral modifications, and pesticide application.

Section II. Avoidance

2-2. Field Strategies

The most effective and obvious means of preventing exposure to arthropods is to avoid their known habitats. Absolute avoidance of arthropod pests is often neither practical nor possible. If the tactical situation allows, choose bivouac sites that are dry, open, and as uncluttered as possible. Avoid sites with rodent burrows and proximity to local settlements, animal pens, and other areas where arthropod infestations are likely to be concentrated. Limit or avoid contact with indigenous human populations in lesser-developed countries because they are often reservoirs for many diseases of military importance.

2-3. Information Sources

a. PVNTMED personnel should provide guidance on the presence of arthropod populations in an area based on information obtained through surveillance or via intelligence sources.

(1) The Defense Pest Management Information Analysis Center (DPMIAC) of the Armed Forces Pest Management Board (AFPMB) compiles Disease Vector Ecology Profiles (DVEPs), which are concise, comprehensive summaries of the vector-borne diseases that occur in specific countries or other geographic areas. The DVEPs focus on causative agents, vector importance, bionomics, behavior, and pesticide resistance, as well as provide basic information on the geography and customs of each country. They may be obtained from the DPMIAC, 6900 Georgia Avenue NW, Bldg 172 Forest Glen Section, Walter Reed Army Medical Center, Washington, DC 20307-5001, DSN 295-7479, commercial 301-295-7479, or from the AFPMB web site at http://www.afpmb.org .

(2) The Navy prepares Vector Risk Assessment Profiles (VECTRAPs), which are concise, up-to-date summaries of practical information on vector ecology and disease incidence in specific countries. They are available as hard copy or on computer disk from the Navy Environmental Health Center, 2510 Walmer Avenue, Norfolk, VA 23513-2617, DSN 253-5593, commercial 757-462-5593.

(3) In addition, up-to-date worldwide information on diseases and vectors may be obtained from the Armed Forces Medical Intelligence Center (AFMIC), Fort Detrick, Frederick, MD 21702-5004, DSN 343-7269, commercial 301-619-7269.

2-4. Emergency Requisition of Repellents and Pesticides

Repellents and pesticides can be acquired rapidly by calling the Emergency Supply Operations Center (ESOC) at the Defense Supply Center of Richmond (DSCR), 8000 Jefferson Davis Highway, Richmond, VA 23297-5000, at DSN 695-4865; commercial (804) 279-4865. The Center provides emergency supply needs 24 hours a day, 7 days a week.

Section III. Physical Barriers

2-5. Clothing

a. Field Uniform

Clothing is the first direct line of personal defense against arthropods. Proper wearing of the field uniform is essential to minimize skin exposure (Figure 2-1). If the risk of heat stress is a factor in a particular environment, common sense or advice from medical/PVNTMED personnel should dictate when the following recommendations are not practical.

Figure 2-1. Proper Wearing of Field Uniform Minimizes Exposure to Arthropod Attack

(1) Tuck the pant leg into the boot or into the sock. This forces non-flying pests such as ticks, stinging ants, and spiders to climb up the outside of the pant leg, thus decreasing access to the skin and increasing the likelihood of being seen.

(2) Roll the sleeves down and close the collar to help protect the arms and neck from attack. This is especially important from dusk until dawn when many mosquito species and other nocturnal blood feeders are active.

(3) It is difficult for attacking pests to bite through the uniform fabric unless it is pulled tightly against the skin. Therefore, the uniform should be worn loosely, with an undershirt worn underneath the shirt to act as an added barrier.[50] The undershirt should be tucked into the pants to decrease access of crawling arthropods to sensitive bodily regions.

(4) The field cap and its brim help protect the head and face. Some biting insects tend to avoid the shaded area of the face under the cap's brim.[48] In areas heavily infested with flying pests, a head net can be used over the cap or helmet.

b. Tick Checks

(1) When in tick-infested habitats, check clothing routinely, and use the buddy system to check areas of the body that cannot easily be seen during self-examination (Figure 2-2).

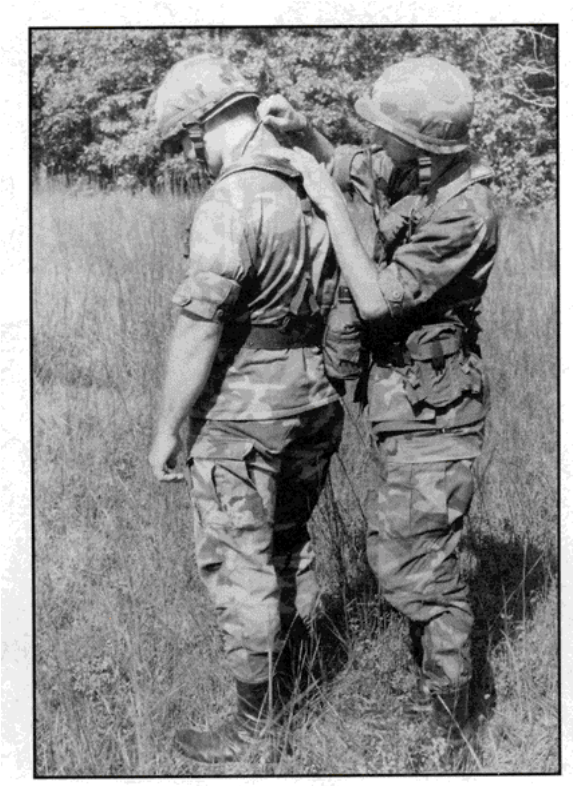


Figure 2-2. Buddy-System Check for Ticks

(a) Ticks can be picked off of clothing by hand. However, avoid crushing them with your fingernails because their body fluids may be infective. After removal, disposal may pose a problem. If returned to the immediate area, ticks may reattach to the clothing or attack another individual. They can be destroyed by placing them in alcohol or by securing them within a piece of folded tape.

(b) Ordinary masking tape, cellophane tape, or similar substitute, are useful to remove ticks from clothing. A ring of tape can be made around the hand by leaving the sticky side out and attaching the two ends. Ticks will adhere to the tape when it is dabbed against the clothing (Figure 2-3). The tape can then be folded carefully over the ticks to prevent their escape and discarded with the trash.

(c) An adhesive lint roller (available from most post/base exchanges and commissaries) is a very efficient means of quickly removing large numbers of ticks from the

uniform, especially the very tiny larvae, which may be present in clusters of several hundred (Figure 2-4).

(2) Once the clothing is removed, it is important to carefully check all areas of the body for evidence of ticks or chiggers. Reexamine the clothing, inside and out, and remove and dispose of all ticks.

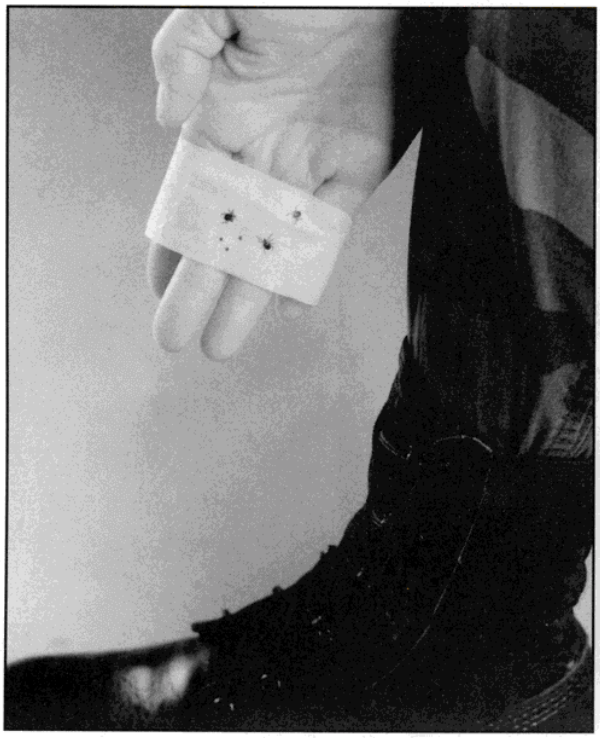


Figure 2-3. Remove Ticks Using a Ring of Tape

Figure 2-4. Remove Ticks Using Lint Roller

c. Tick Removal

If a tick is found attached to the body, seek medical authorities for proper removal, or follow the guidelines in Appendix C.

d. Chiggers

(1) Since chigger mites are very small and difficult to see, their presence is generally not detected until the appearance of intensely itching bites.

(2) Wearing repellent-impregnated uniforms greatly reduces the likelihood of being infested with chiggers (see Section IV).[5]

(3) Bathing after field work, or as soon as operationally permissible, may reduce the severity of the resultant chigger infestation.

(4) Medical personnel may prescribe an antipruritic or antibiotic to help reduce itching or secondary infection.

e. Spiders, Scorpions, and Snakes

To reduce the chance of being bitten (or stung) by spiders, scorpions, and snakes:

(1) Always wear shoes or boots coupled with the added protection of socks during waking hours.

(2) Never walk outdoors in bare or stocking feet.

(3) Shake out boots before putting them on.

(4) Store boots with socks pulled down over the boot tops as far as possible to prevent entry of such pests.

(5) Do not reach into concealed areas that might harbor spiders, scorpions, or snakes without carefully checking first.

Table 2. Repellents, and Personal Protective Clothing & Equipment Available Through the Military Supply System

NSN	Nomenclature[2, plus updates]	Unit of Issue
6840-01-284-3982	Insect repellent, personal application (3M7/EPA 58007-1), 33% DEET	12 2-oz tubes/box
6840-00-753-4963	Insect repellent, clothing and personal application, 75% deet, 25% ethanol FOR USE WITH REPELLENT PARKA ONLY	2-oz bottle
6840-00-142-8965	Insect repellent, personal application, approximately 30% DEET (varies based on item currently being stocked)	12 1-oz cartridges/box (varies based on item being stocked)
6840-01-288-2188	Insect repellent, personal application & sunscreen, approx. 20% DEET/SPF 15 (varies based on item currently being stocked)	12 3/4-oz tubes/box (varies based on item being stocked)
6840-01-345-0237	Insect repellent, clothing application, 40% permethrin (IDA)	12 kits/box
6840-01-278-1336	Insect repellent, clothing application, aerosol, 0.5% permethrin (Permethrin Arthropod Repellent)	12 6-oz cans/box
6840-01-334-2666	Insect repellent, clothing application, permethrin, 40% liquid (2-gallon sprayer)	12 151-ml bottles/box
6840-01-412-4634	Insecticide, d-Phenothrin, minimum 1.92%, space spray	12-oz aerosol can
7210-00-266-9736	Insect net protector, cot type	EA
7210-00-267-5641	Poles, folding cot, insect net protector	4 poles/set
8415-00-935-3130	Head net, insect	EA
8415-01-035-0846 -0847 -0848	Parka, fabric mesh, insect repellent (DEET jacket), small, medium, and large	EA
3740-00-641-4719	Sprayer, pesticide, manually carried, pressure type, 2-gallon, equipped with pressure gauge	EA
3740-01-332-8746	Gauge, pesticide sprayer (for retrofit use on 2-gallon sprayers not equipped with a gauge)	EA
4330-01-332-1639	Filter, fluid, (must be used with gauge NSN 3740-01-332-8746)	EA

7 **3M is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul, Minnesota**

2-6. Protective Equipment

a. Introduction.

There are several equipment items available through the military supply system that can be used to augment the physical protection afforded by clothing (see Table 2).[2, plus updates]

(1) In areas heavily infested with flying pests, a head net can be used over the cap or helmet. Indoor protection can be greatly enhanced by using bed nets and tent screens. Unlike head nets, however, the mesh size of bed netting and tent screens is not fine enough to keep out all biting arthropods, especially biting midges and sand flies. Treating bed nets and tent screens with repellents can significantly reduce the ability of these arthropods to gain entry (see insect net protector, paragraph 2-6c, and Section IV).[16,69]

(2) In addition, where biting midges are a serious problem, head nets may also be worn while sleeping.

b. Insect Head Net.

(1) The insect head net (Figure 2-5) (NSN 8415-00-935-3130) is a finely woven (30-mesh/inch), olive drab, nylon head covering that can be worn over the bare head, cap, helmet, or helmet liner (Figure 2-6). The cloth top piece has an elastic headband on the inside that fits securely over the head gear. A fabric-covered metal hoop holds the net away from the head and neck.

(2) Put on the head net so that the elastic headband rests comfortably on the upper part of the forehead or grips close above the brim of the helmet. Tie the drawstring permanently so the drawstring knot is about 8 inches below the chin and the net fits snugly below the collar, both front and back. Hook the elastic loops found at the drawstring edge of the net over the breastpocket buttons.

(3) For quick removal of the head net, grasp the back edge where it rests over the collar and pull forward over the head (Figure 2-7).

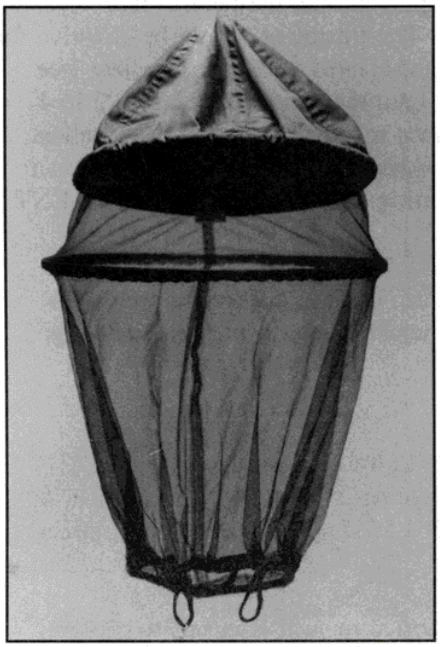


Figure 2-5. Insect Head Net, NSN 8415-00-935-3130

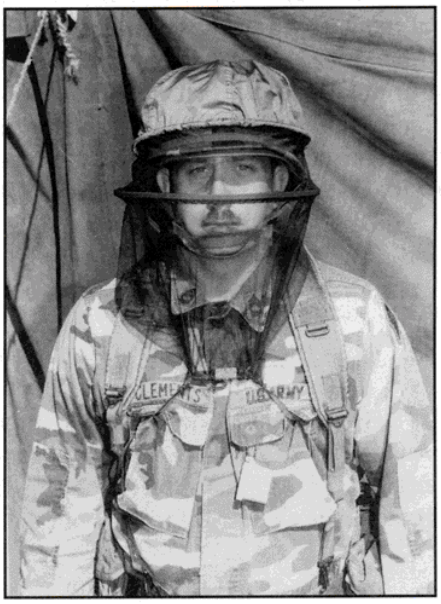


Figure 2-6. Head Net Over Helmet

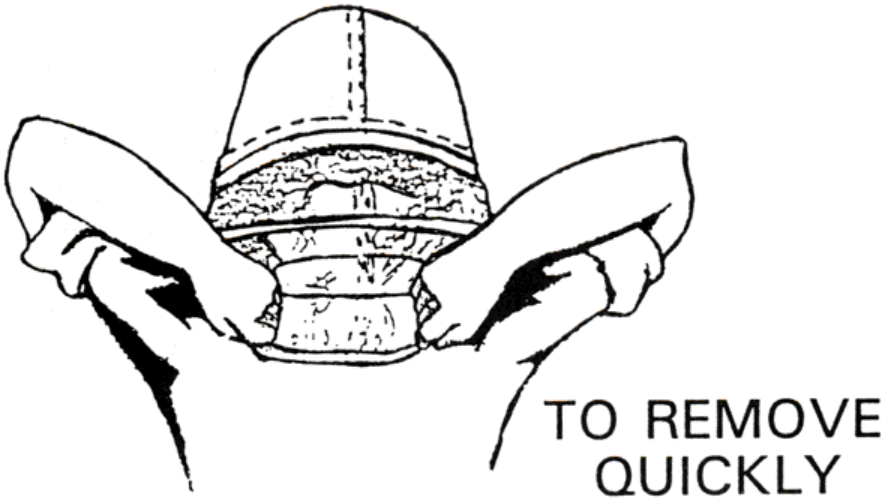


Figure 2-7. Remove Insect Net From the Back

(4) The head net is especially useful in areas of very dense mosquito or biting fly populations. It may be worn while sleeping.

(5) For added protection, the head net may be lightly sprayed with permethrin [see paragraph 2-9c(2)]. Allow it to dry thoroughly before wearing. The treatment should be effective for several months. In the absence of permethrin, the net may be hand-treated with DEET repellent [see paragraph 2-8c(2)] every evening by dispensing a small quantity onto the palm of one hand (3 to 4 drops of the liquid, or a small dab of the lotion), rubbing the hands together to spread the repellent, and finally rubbing the netting between the hands. Repeat the process until all the netting has been lightly and evenly covered. It is not necessary to saturate the netting. **KEEP DEET REPELLENT OFF OF THE ELASTIC AS IT MAY BE DAMAGED.**

(6) Because of its small mesh size, the insect head net can be very hot for the wearer or may obscure vision, making it impractical in some climates and under certain deployed conditions.

c. Insect Net Protector (Mosquito Bed Net).

(1) The insect net protector (Figure 2-8) (NSN 7210-00-266-9736) is a finely woven (27-mesh/inch), olive drab, nylon canopy that can be used with the folding cot, hammock, steel bed, or shelter half-tent. An insect net protector frame (NSN 7210-00-267-5641, poles, folding cot, insect net protector) is available for use with the folding cot.

(2) The insect net protector should be erected and supported in such a way as to prevent contact of the net with the sleeping person. This will keep mosquitoes and other biting flies from biting the individual through the net.

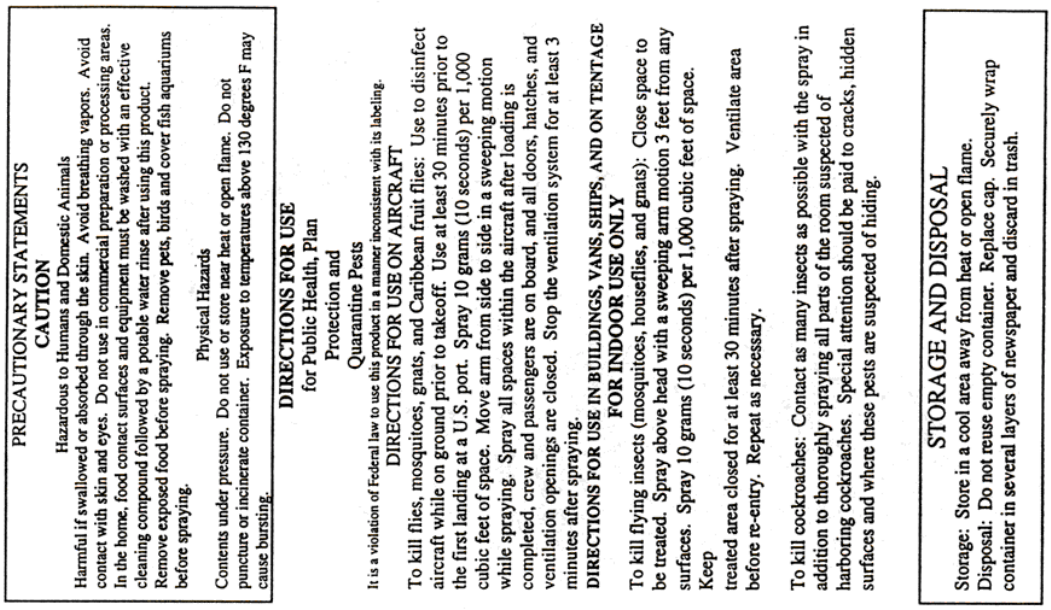
Figure 2-8. Insect Net Protector (Mosquito Bed Net), NSN 7210-00-266-9736 Used With Poles, (NSN 7210-00-267-6541), on Folding Cot.

(3) Do not leave net in contact with the ground as crawling arthropods may use it to gain access to the sleeping area. Tuck the net under the mattress or sleeping bag. Bed nets should be installed before dusk, which is when many mosquitoes become active.

(4) Prior to retiring, any mosquitoes trapped inside the enclosure should be killed with the standard insecticide space spray, 2-percent d-phenothrin (NSN 6840-01-412-4634)(Figure 2-9). This item **replaces** NSN 6840-01-067-6674. Avoid breathing the pesticide vapors while spraying, and **DO NOT USE 2-PERCENT D-PHENOTHRIN ON THE SKIN OR CLOTHING**.

(5) Before climbing inside, spray the net lightly with permethrin aerosol [see paragraph 2-9c(2), and Figure 2-22], or use the 2-gallon sprayer method prior to setting it up [see paragraph 2-9c(3)(e) and Figure 2-25]. The permethrin will help protect against arthropods that are small enough to fit through the mesh of the net (e.g. sand flies). Allow the net to dry before handling. Permethrin applied by the 2-gallon sprayer method provides protection for several months to a year or more.[21,36]

Figure 2-9. Standard Insecticide Space Spray, 2% D-Phenothrin



DLA
INSECTICIDE, AEROSOL
d-PHENOTHRIN, 2%
NSN 6840-01-412-4634
MIL. SPEC. 47243-20606

ACTIVE INGREDIENTS:
3-phenoxybenzyl d-cis and trans* 2,2-dimethyl-3-(2-methylpropenyl) cyclopropanecarboxylate..... 1.92%
Other isomers..... 0.08%
INERT INGREDIENTS
1-chloro-1, 1 difluoroethane..... 58.80%
Chlorodifluoromethane..... 39.20%
100.00%
*cis/trans isomer ratio: max 25% (+ or -) cis, min 75% (+ or -) trans
WARNING: Contains 1-CHLORO-1, 1 DIFLUOROETHANE, CHLORODIFLUOROMETHANE, substances which harms public health and the environment by destroying ozone in the upper atmosphere.

KEEP OUT OF REACH OF CHILDREN
CAUTION
See Back Panel for Additional Precautionary Statements

STATEMENT OF PRACTICAL TREATMENT
IF SWALLOWED: Call a physician or Poison Control Center immediately.
IF INHALED: Remove victim to fresh air.
IF ON SKIN: Remove contaminated clothing and wash affected areas of the skin with soap and water. Get medical attention if irritation persists. Wash contaminated clothing separately from other laundry.
IF IN EYES: Flush eyes with plenty of water. Get medical attention if irritation persists.

Net Weight 12 oz.
Manufactured by:
AIROSOL COMPANY, INC.
Neodesha, KS 66757
316/325-2666
EPA Reg. No. 901-82
EPA Est. No. 901 KS 1

PRECAUTIONARY STATEMENTS
CAUTION
Hazardous to Humans and Domestic Animals
Harmful if swallowed or absorbed through the skin. Avoid breathing vapors. Avoid contact with skin and eyes. Do not use in commercial preparation or processing areas. In the home, food contact surfaces and equipment must be washed with an effective cleaning compound followed by a potable water rinse after using this product. Remove exposed food before spraying. Remove pets, birds and cover fish aquariums before spraying.

Physical Hazards
Contents under pressure. Do not use or store near heat or open flame. Do not puncture or incinerate container. Exposure to temperatures above 130 degrees F may cause bursting.

DIRECTIONS FOR USE
for Public Health, Plan
Protection and
Quarantine Pests
It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
DIRECTIONS FOR USE ON AIRCRAFT
To kill flies, mosquitoes, gnats, and Caribbean fruit flies: Use to disinfect aircraft while on ground prior to takeoff. Use at least 30 minutes prior to the first landing at a U.S. port. Spray 10 grams (10 seconds) per 1,000 cubic feet of space. Move arm from side to side in a sweeping motion while spraying. Spray all spaces within the aircraft after loading is completed, crew and passengers are on board, and all doors, hatches, and ventilation openings are closed. Stop the ventilation system for at least 3 minutes after spraying.
DIRECTIONS FOR USE IN BUILDINGS, VANS, SHIPS, AND ON TENTAGE
FOR INDOOR USE ONLY
To kill flying insects (mosquitoes, houseflies, and gnats): Close space to be treated. Spray above head with a sweeping arm motion 3 feet from any surfaces. Spray 10 grams (10 seconds) per 1,000 cubic feet of space. Keep
treated area closed for at least 30 minutes after spraying. Ventilate area before re-entry. Repeat as necessary.

To kill cockroaches: Contact as many insects as possible with the spray in addition to thoroughly spraying all parts of the room suspected of harboring cockroaches. Special attention should be paid to cracks, hidden surfaces and where these pests are suspected of hiding.

STORAGE AND DISPOSAL
Storage: Store in a cool area away from heat or open flame.
Disposal: Do not reuse empty container. Replace cap. Securely wrap container in several layers of newspaper and discard in trash.

Figure 2-9. Standard Insecticide Space Spray, 2-Percent D-Phenothrin, NSN 6840-01-412-4634. Use to Knockdown Flying Arthropods Within an Enclosure Such as an Erected Insect Net Protector

Section IV. Repellents

2-7. Introduction

a. The concurrent use of repellents on the skin (DEET) and clothing (permethrin) provides maximum personal protection against arthropods.[14,19,51,52,59,61,63] The nomenclature and NSNs for these items are listed in Table 2. This dual strategy is known as the **DOD INSECT REPELLENT SYSTEM** (see paragraph 2-11).

(1) Mosquitoes and some other biting flies bite exposed skin or through light-weight clothing, whereas black flies, sand flies, biting midges, ticks, chiggers, and fleas may crawl underneath clothing to bite, in addition to biting exposed skin.[1] Consequently, both types of treatments are necessary to provide maximum protection.

(2) Clothing treatment with permethrin alone ordinarily does not adequately protect exposed skin because there is very limited vapor action. Rather, permethrin acts as a contact toxicant while DEET is a vapor active repellent.

(3) Not all arthropod species are equally repelled by a particular repellent. While DEET is highly repellent to most mosquito and biting fly species, some species of biting midges, as well as some *Anopheles* mosquitoes (malaria vectors), are only partially repelled.[47] Therefore, one should not discontinue using repellent if some bites are received when wearing DEET, as other species that are present are still likely to be repelled. This example further illustrates the wisdom of utilizing the **DoD Insect Repellent System** [i.e. simultaneous use of both skin (DEET) and clothing (permethrin) repellents].

(4) Some insect species are active during the day; others only at night. For this reason, it is important to follow recommendations provided by commanders and medical personnel, which may indicate the necessity of using repellents around the clock. Remember that lack of bites during the day does not preclude the threat of attack at the night.

c. Proper use of repellents will also reduce problems posed by filth flies and other nuisance pests.[17] Unfortunately, no repellents appear to be significantly effective against stinging arthropods, such as bees, wasps, fire ants, and scorpions. The best strategy against them is avoidance, and personal protective clothing and equipment.

2-8. DEET
(N,N-diethyl-m-toluamide or N,N-diethyl-3-methylbenzamide).

a. Introduction

Since 1957, the military has used DEET as it's standard skin repellent.[47] DEET is effective against a wide variety of arthropod species, especially mosquitoes and other biting flies, but also fleas, ticks, and chigger mites. In addition, DEET has been reported to provide effective protection, in areas where land leeches are a problem, primarily Southeast Asia.

b. Health and Safety Considerations

(1) DEET has been used safely for over 40 years by millions of people worldwide. Although it has an excellent safety record, there have been sporadic reports of harmful effects associated with its use. Most of these have been related to improper use, such as swallowing, spraying into the eye or applying to already irritated skin. While most of the complaints involve temporary minor skin or eye irritation, rare cases of toxic encephalopathy (inflammation of the brain) have been reported, but not confirmed, to be associated with DEET usage, especially in young children. Other reported adverse reactions associated with, but not confirmed to be directly caused by DEET itself, have included headache, nausea, behavioral changes, disorientation, muscle in coordination, irritability, confusion, and difficulty sleeping. While 50 to 100 million or more people use DEET each year, there have been remarkably few reports of toxicity as a result of dermal application.

(2) Since a small population of individuals may be sensitive to any chemical, it is important for personnel to apply repellents carefully and to be aware of possible signs of intoxication. Apply DEET lightly and evenly to exposed skin. Avoid contact with sensitive mucous membranes (e.g. eyes), the lips (accidental ingestion), and broken skin (e.g. abrasions, sunburn, poison ivy).

(3) If the tactical situation permits, wash off DEET repellent after the potential exposure to arthropods has ceased. Although DEET is not soluble in water, it quickly washes off of skin, and out of clothing, with soap and water.

(4) DEET is a plasticizer and must be used with care to prevent damage to plastics, rubber, vinyl, or elastic items such as eyeglass frames, plastic lenses, and cases; contact lenses; combs; watch crystals; goggles; painted and varnished surfaces; and some synthetic fabrics (nylon excepted). The water-repellent properties of Gore-Tex® are also reduced by DEET. DEET does **NOT** damage cotton or wool fabrics (Gore-Tex® is a registered trademark of W.L. Gore and Associates, Inc., 555 Paper Mill Road, Newark, DE 19711).

c. Formulations

Several DEET formulations, as well as a mesh parka, which provides protection when DEET-treated, are available through the military supply system. **THE EXTENDED-DURATION FORMULATION IS THE STANDARD, RECOMMENDED MILITARY SKIN REPELLENT BECAUSE IT IS SUPERIOR TO THE OTHERS** (see paragraph (1), below).

(1) Two-Ounce Tube

(Insect Repellent, Personal Application, 3M/EPA Reg. No. 58007-1, extended-duration, NSN 6840-01-284-3982)(Figure 2-10)

(a) **THIS HAS BEEN THE MILITARY SKIN REPELLENT OF CHOICE** since 1990, when it first became available in the military supply system. It was developed by the Department of Defense in collaboration with the 3M Corporation. The product contains 33-percent DEET in a controlled-release polymer base, and is a non-greasy, white lotion with a mild, pleasant odor. The polymer in the formulation slows the absorption and evaporation of DEET, thereby holding it on the surface of the skin where it can continue to repel arthropods for an 'extended' period of time. Laboratory testing shows that the extended-duration DEET lotion provides 6 hours of at least 95-percent protection against a variety of mosquito species in a tropical environment, 10 hours in a hot, dry environment, and 12 hours in a forested/wet environment[15].

(b) Follow label directions. Dispense the lotion into one hand, rub the hands lightly together, and apply thoroughly in a thin layer over the forearms, upper arms, face, neck, ears, and other exposed areas. **DO NOT APPLY REPELLENT TO THE EYES AND LIPS, OR TO SENSITIVE OR DAMAGED SKIN** (for example, sunburn, abrasions, and poison ivy). Do not waste DEET by applying it thickly; a light, uniform coating provides excellent repellent protection.

(c) If you begin to receive bites, reapply the repellent as described in paragraph (b), above. The value of the extended-duration formulation is that the polymer, by slowing loss of DEET from the skin surface, retains DEET at a concentration sufficient to repel arthropods for a long period of time [see paragraph (a), above]. Repellent formulations containing higher concentrations of DEET do not provide longer, or better, repellency.

(d) The extended-duration DEET formulation does **NOT** adversely affect the seal of the individual protective mask.[33] However, the mask should be washed after each use to preclude damage to its surfaces by long exposure to residues of DEET.

(e) The extended-duration DEET formulation does **NOT** affect the infrared signature of the soldier[27].

(f) The extended-duration DEET formulation **CAN** be safely used with camouflage face paint; apply a thin layer of DEET first, followed by the face paint.

Figure 2-10. Standard Military Skin Repellent, 33-Percent DEET, 2-Ounce Tube Extended-Duration, NSN 6840-01-284-3982

(f) Storage and disposal.

(1) This product is water-based and nonflammable. It is heat and cold stable, but at 140 F, some separation is possible and the product may begin to leak from the container.[41] Under optimum conditions, shelf-life is five years or longer.

(2) After dispensing the contents, wrap the container in accordance with label instructions and discard in the trash. In contingency situations, follow appropriate operational guidance.

(2) Two-Ounce Bottle
(Insect Repellent, Clothing, 75-percent DEET, 25-percent ethanol, NSN 6840-00-753-4963)(Figure 2-11)

(a) **THIS PRODUCT IS INTENDED SOLELY FOR TREATING THE INSECT REPELLENT PARKA** [see paragraph (3), below]. It contains 75-percent DEET in ethanol. Prior to development of the superior extended-duration DEET formulation, this product served for many years as the standard military skin repellent. Although an effective repellent, it had to be reapplied frequently, felt 'oily', had an objectionable odor, and was a strong plasticizer. Due to its high DEET concentration, it must be used with extreme care, as it will severely damage plastic, rubber, vinyl and elastic items, such as watch crystals, combs, eyeglass frames and cases, contact lenses, and some synthetic fabrics. It reduces the water-repellency of Gore-Tex®.

(b) The 75-percent DEET formulation will **NOT** damage nylon, cotton, or wool fabrics, nor does it affect the infrared signature of the soldier.[27] It leaches quickly out of clothing and off of skin upon contact with water.

(c) If permethrin (see paragraph 2-9) is not available, DEET may be used to treat the insect head net for added protection [see paragraph 2-6b(5)].

Figure 2-11. Insect Repellent, Clothing, 75-Percent DEET, Two-Ounce Bottle 25-Percent Ethanol, NSN 6840-00-753-4963

(d) Storage and Disposal.

(1) DEET is both heat and cold stable. However, the diluent, ethanol, has a very low vapor pressure and is very flammable. Therefore, exposure of the product to flame or excessive heat should be avoided. Because of the volatility of ethanol, it can evaporate over time, creating a more concentrated product. Under optimum conditions, and when the caps are tightly secured, the shelf-life of this product is indefinite.

(2) This formulation, because of the ethanol ingredient, should **NEVER** be stored in close proximity to calcium hypochlorite because the two products will react violently if they contact one another. Flash fires have occurred in such cases.

(3) Dispose of empty containers by wrapping in newspaper or a plastic bag and discarding in the trash. In contingency situations, dispose of in accordance with operational guidance.

(3) Insect Repellent Parka.

(a) An insect repellent parka or overjacket is available (small, medium, large: NSN 8415-01-035-0846; -0847; -0848, respectively) (Figure 2-12). It is made from wide-mesh polyester-cotton netting, and is worn over outer clothing after being treated with a full 2-ounce bottle of 75-percent DEET [NSN 6840-00-753-4963, see paragraph (2), above]. One bottle of DEET is supplied with the parka, but subsequent bottles for re-treatment must be requisitioned separately. The parka is waist-length, has extra long sleeves and a hood. It is packaged in a re-sealable plastic bag in which it is treated, and then stored when not in use to retain repellent effectiveness. If the DEET is not washed out, and the parka stored in its bag between uses, it will remain effective against mosquitoes, biting midges, and other biting flies for about 6 weeks before re-treatment is necessary.[20] **THE PARKA OFFERS NO PROTECTION UNLESS IT IS TREATED WITH REPELLENT**.

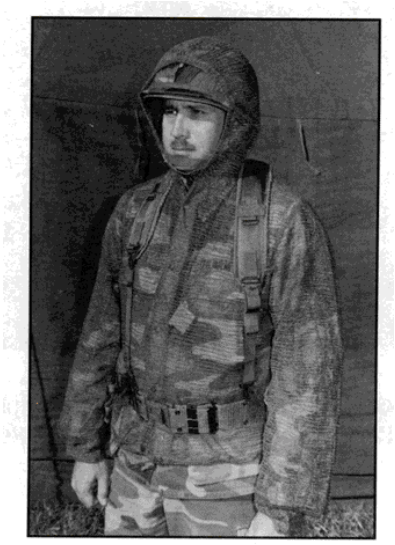


Figure 2-12. Insect Repellent Parka

NSN 8415-01-035-0846; 0847; 0848 (Small, Medium, Large, Respectively)

(b) After removing the bottle of DEET repellent and the instruction sheet from the bag, pour the repellent onto the top and sides of the folded parka in the bag. Reseal the plastic bag for 24 hours, remove the parka from the bag and air-dry for at least 1 hour before using. Save the bag for storage and re-treatment of the parka, as needed.

(c) For best results, wear the insect repellent parka over an undershirt or the uniform shirt to augment the physical protection afforded by clothing and to avoid possible skin irritation. The hood should be worn over the helmet, cap, or the bare head, and can be drawn up snugly when necessary to prevent bites to the head. Wear the sleeves over the hands whenever possible. At times, exposed skin areas and untreated clothing not covered by the parka may not receive adequate protection, and the supplemental use of skin or clothing repellent may be required.

(4) Insect Repellent Stick
(Personal Application, 30-percent DEET, NSN 6840-00-142-8965)

(a) This product is a 1-ounce, waxy repellent stick marketed as Cutter® Insect Repellent Stick (Figure 2-13)(Cutter® is a registered trademark of Miles, Inc., 7123 West 65th St, Chicago, IL 60638-4698). It contains 30-percent DEET in a waxy base. It repels mosquitoes, biting midges, stable flies, sand flies, black flies, ticks, fleas, and chiggers. Its stable waxy formulation and convenient small size make it suitable for inclusion in survival kits. This formulation, however, is not as effective as the extended-duration DEET lotion or the permethrin clothing impregnant.

Figure 2-13. Insect Repellent Stick, 30-Percent DEET
Personnel Application, 1-Ounce, NSN 6840-00-142-8965

(b) To use, push the stick up ½ inch. Apply over all exposed skin. Avoid the eyes and lips. For chiggers, fleas and ticks, also apply to the socks, tops of the shoes, and around all openings in the outer clothing. The product will not damage nylon, cotton, or wool. However, it may damage some synthetic fabrics, plastics, paints, and varnishes.

(c) Storage and disposal.

(1) The Cutter Insect Repellent stick is cold stable. At 140^0F, however, the stick will begin to melt and leakage from the container can be expected.[38] The product is not flammable, and under optimum conditions, the shelf-life is indefinite.

(2) After using the contents, wrap the container according to label instructions and discard in the trash. In contingency situations, dispose of in accordance with operational guidance.

(5) Insect Repellent With Sunscreen
(Personal Application, NSN 6840-01-288-2188)

(a) This item is intended solely for use as a component of survival kits. The specific item stocked under this NSN varies, based on the most suitable product available at the time. The product will contain both DEET and sunscreen ingredients in various concentrations (e.g. 20-percent DEET/SPF 15).

(b) Follow the label directions for use and disposal instructions.

2-9. Permethrin
[(3-phenoxyphenyl) methyl (+/-) cis/trans 3-(2,2-dichloroethenyl) 2,2-dimethyl-cyclopropanecarboxylate].

a. Introduction

(1) Permethrin is the most recent addition to the arsenal of personal protective repellents, and is the most effective clothing impregnant available. Its primary mode of action is contact toxicity, particularly against crawling arthropods such as ticks[25,34,55,57,58], chigger mites[5], fleas[24], and lice.[35,62] Permethrin also acts as a contact repellent against mosquitoes[20,56,59,63], biting flies[20,56,59,63,67,68], and to a lesser degree, kissing bugs[6]. It is odorless, nonirritating, and resistant to washing and wear abrasion (rubbing off).[54,60] Permethrin is bound so strongly to fabric that detergent and water will not remove it: a significant level of permethrin remains in a treated uniform through multiple launderings.[10,29,30,53,56] After several washings, treated uniforms will continue to provide contact repellency, even though they may no longer be toxic to insects. **PERMETHRIN WILL NOT WASH OUT OF TREATED UNIFORMS WHEN WORN IN THE RAIN OR WHEN FORDING STREAMS, ETC.** Permethrin-treated clothing offers a new passive approach to control of human lice which was not previously feasible.[36,62] Former control agents were either less effective (M-1960[66] clothing impregnant) or were promoting resistance in louse populations (lindane[70] dust).

(2) Because it does not evaporate, permethrin does not provide protection to exposed skin adjacent to treated clothing. However, by treating uniforms and other articles such as tents, bed and head nets, and camouflage helmet covers, flying arthropod populations in a limited area may be reduced, since arthropods which land on treated fabric will be killed.[52]

(3) Permethrin can be used to treat hot weather (100-percent cotton) and temperate (50-percent/50-percent nylon/cotton; woodland or desert camouflage) military field uniforms. Treat uniforms before deploying, or as soon as possible once deployed.Once treated, **DO NOT DRY-CLEAN UNIFORMS WITH CHLOROFLUOROCARBON-BASED SOLVENTS (CFCs)**. These solvents will totally remove the permethrin.[37] However, dry-cleaning with perchlorethylene does not remove permethrin. Although fire retardant properties of **Nomex®** flight suits are unaffected by permethrin[28], the repellent does not uniformly or strongly bind to Nomex® fabric using current application processes. Thus, use of permethrin on Nomex® fabric uniforms is not recommended at this time. (Nomex® is a registered trademark of E.I. DuPont de Nemours and Co., Inc., Wilmington, Delaware.)

(4) Other cloth items such as mosquito netting, camouflage helmet covers, ground covers, and tentage (with the exception of vinyl-coated temper tents) may also be treated in the field. **Temper tents** that have a vinyl-urethane finish **cannot** be treated with permethrin, because the finish is water repellent; permethrin solutions will simply drip off. Eventually, these military tents may be manufactured with permethrin impregnated into the finish; such tents are already available commercially.

b. Health and Safety Considerations

(1) The uniform cap should not be treated with permethrin because of the potential for excessive permethrin absorption through the scalp. Treatment of the cap is not critical since, due to its construction, it is considered impenetrable to biting insects.

(2) DO NOT treat underwear, including T-shirts. Permethrin is poorly absorbed and is rapidly inactivated in mammals.[23,65] Even so, wearing untreated undergarments significantly reduces the risk of exposure to fabric impregnants.[11,18,31,32]

(3) Precautionary measures should be observed when handling and mixing permethrin. Avoid permethrin contact with the face, eyes, and skin, and avoid breathing vapors or spray mist. Do not allow skin contact with treated surfaces until the chemical has dried completely. Wear protective gloves when handling wet, treated uniforms. In case of contact with the eyes, flush with plenty of water, and in case of contact with skin, wash with soap and water. Get medical attention if irritation persists. Do not allow the chemical to contact food, mess gear, or water supplies. Thoroughly wash dishes and utensils contaminated with permethrin. **THIS PESTICIDE IS EXTREMELY TOXIC TO FISH AND AQUATIC INVERTEBRATES**.

Keep out of lakes, ponds, or streams. Do not contaminate water by cleaning equipment or disposing of wastes, or with runoff resulting from treatment of uniforms.

c. Formulations

Several different formulations of permethrin are available within the military supply system.

(1) Individual Dynamic Absorption (IDA) Kit
(Insect Repellent, Clothing Application, Permethrin, NSN 6840-01-345-0237)

(a) This item is a protective treatment kit for military field uniforms that is intended for use by the individual. It provides excellent long-term protection (one treatment is effective for the life of the uniform). The IDA kit is sometimes referred to by the nicknames "baggie method" or "shake and bake." The kit contains materials sufficient to treat one complete uniform (shirt and trousers): two plastic vials of permethrin [40-percent emulsifiable concentrate (EC), 9-ml each], two plastic treatment bags, two pieces of twine, one pair of disposable protective gloves, and one black marking pen (one pen per four kits) (Figure 2-14).

(b) Wear the protective gloves when mixing to avoid accidental exposure to concentrated permethrin should spillage occur. Treat the uniform shirt and trousers separately, following the instructions printed on the back of each treatment bag (Figures 2-15 and 2-16).

Figure 2-14. Permethrin IDA Kit, NSN 6840-01-345-0237 for impregnating a Single Field Uniform with Permethrin

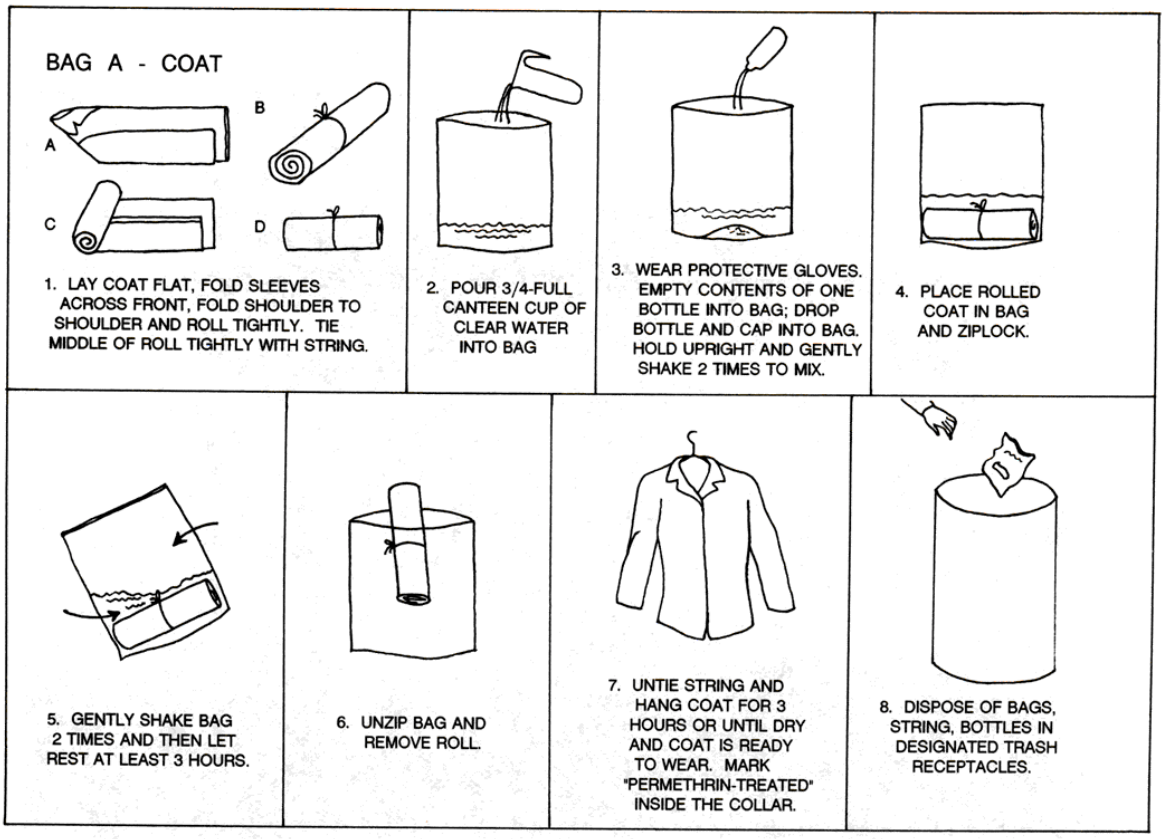


Figure 2-15. IDA Kit Instructions for Impregnating Coat Half of the Field Uniform with Permethrin, as They Appear on Bag A of the IDA Kit.

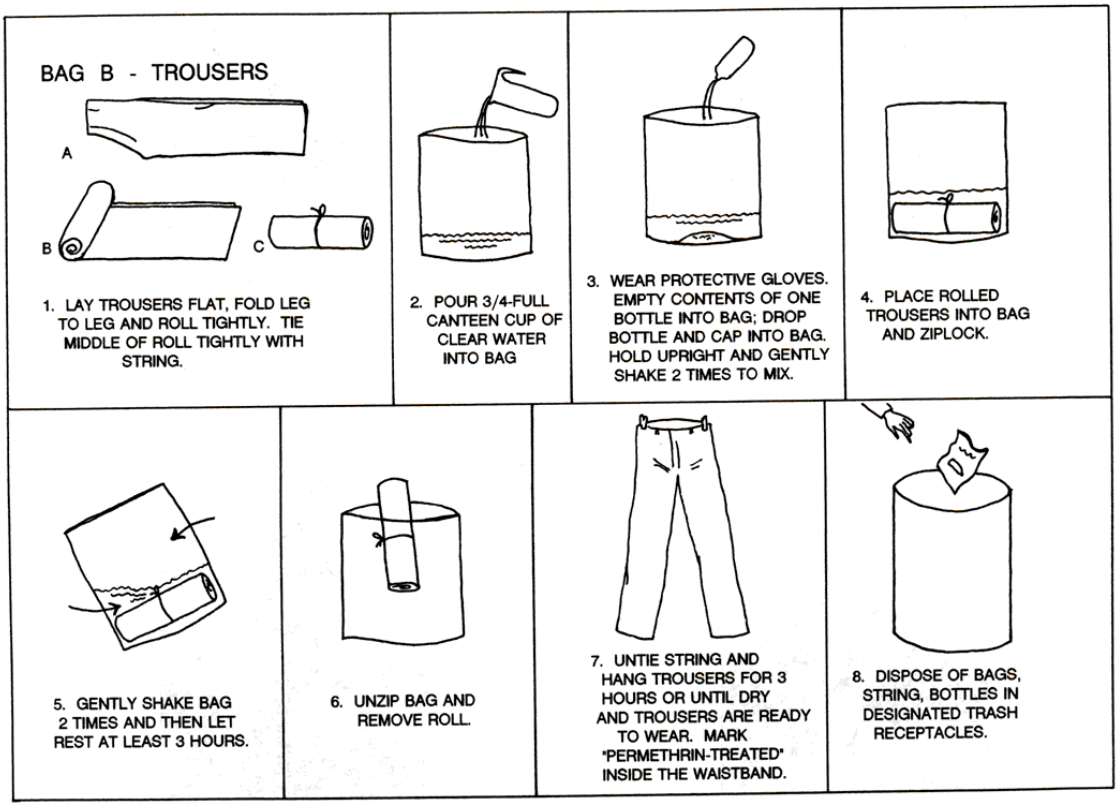
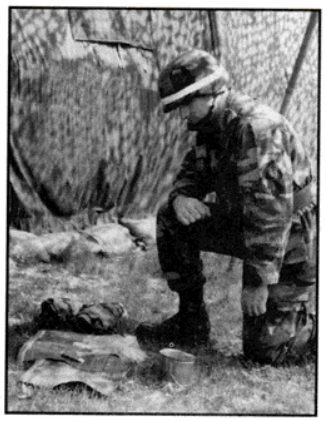


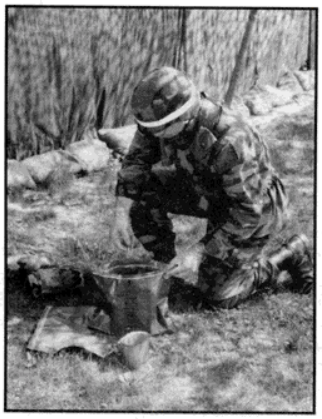
Figure 2-16. IDA Kit Instructions for Impregnating Trouser Half of the Field Uniform with Permethrin, as They Appear on Bag B of the IDA Kit

(c) See Figures 2-17a-c for steps 1 through 9. Assemble all materials (Step 1). Pour approximately 3/4 of a canteen cup (500 ml) of water into one of the bags (Step 2), add the contents of one of the vials of permethrin (Step 3), and gently agitate to mix (Step 4).

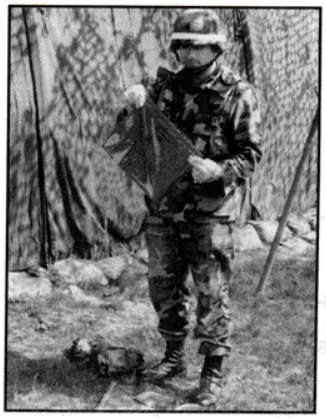


Step 1. Assemble Contents of the IDA Kit

Step 2. Add 3/4-Canteen Cup of Water to a Treatment Bag



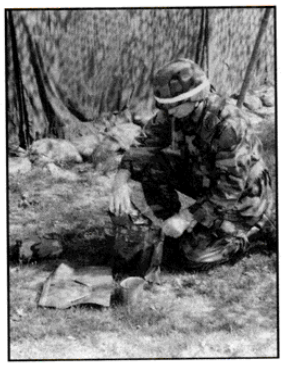
Step 3. Add Contents of One Vial of 40-Percent Permethrin EC to a Treatment Bag



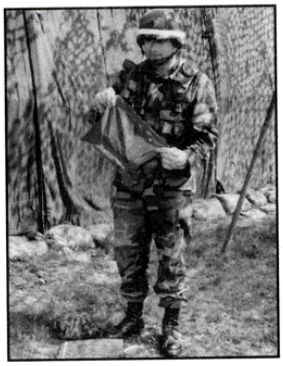
Step 4. Agitate Treatment Bag to Mix Water and Permethrin

Figure 2-17a. Steps 1-4 in Using the IDA Kit, NSN 6840-01-345-0237

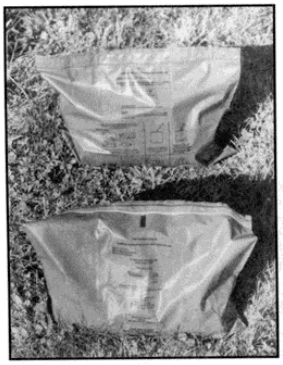
(d) After rolling and tying the garment according to the instructions, place it in the bag (Step 5), re-seal the bag, agitate again (Step 6), and allow to sit for approximately 3 hours (Step 7). During this time, all the liquid is absorbed by the garment. Open the bag, remove the garment, and hang until dry (usually 2-4 hours)(Step 8). Once dry, permethrin has no odor and does not affect the appearance of the fabric. The uniform may now be safely handled and worn. The fabric has been impregnated with permethrin at the rate of 0.125 mg/cm^2. Permethrin is bound so strongly to the fabric by this procedure that water will not remove it: **PERMETHRIN WILL NOT WASH OUT OF TREATED UNIFORM S WHEN WORN IN THE RAIN OR WHEN FORDING STREAMS, ETC.** With the black pen, mark the inside coat collar and the inside waist band 'Perm treat, mo/yr.' This stands for 'Permethrin treated, month/year.'



Step 5. After Rolling and Tying the Garment, Place it in the Treatment Bag



Step 6. Agitate the Treatment Bag to Initially Wet the Whole Rolled Garment



Step 7. Allow Garment to Sit in Treatment Bag for 3 Hours, or More, Until All the Liquid is Absorbed

Step 8. Remove Garment from Treatment Bag and Hang for 3 Hours, or More, Until Completely Dry

Figure 2-17b. Steps 5-8 in Using the IDA Kit, NSN 6840-01-345-0237

(e) **DO NOT RE-TREAT THE UNIFORM:** one treatment is effective in preventing mosquito bites through the fabric for the life of the uniform. **DO NOT TREAT THE UNDERWEAR OR THE CAP**. **REMEMBER THAT DRY-CLEANING WITH CHLOROFLUOROCARBON-BASED SOLVENTS (CFCs) WILL COMPLETELY REMOVE PERMETHRIN.**[37] However, dry-cleaning with perchlorethylene will **NOT** remove permethrin.

(f) Starching field uniforms prior to treatment with permethrin does **NOT** adversely affect impregnation. Homogeneous absorption of permethrin is achieved in both hot and temperate-weather uniforms whether or not they are starched prior to treatment.[29]

(g) Permethrin-impregnated and untreated temperate-weather field uniforms **CAN** be laundered together. No significant transfer of permethrin from treated to untreated uniforms occurs during laundering.[29]

(h) Store as described in paragraph 2-7c(3)(g)(1), below. Under optimum conditions, the shelf life of this product is indefinite. If deterioration of the containers, and/or leakage of the contents, is detected prior to this time, turn in the product for proper disposal.[39] Do not reuse empty treatment bags. Place all used kit components into one treatment bag (Step 9), seal the bag, and put in the trash. In contingency situations, dispose of in accordance with operational guidance.

(i) This product is flammable and must be shipped in accordance with Department of Transportation (DOT) regulations.[8]

Step 9. Place All Used IDA Kit Components Into One Treatment Bag, Seal the Bag, and Put in Trash

Figure 2-17c. Step 9 in Using the IDA Kit, NSN 6840-01-345-0237

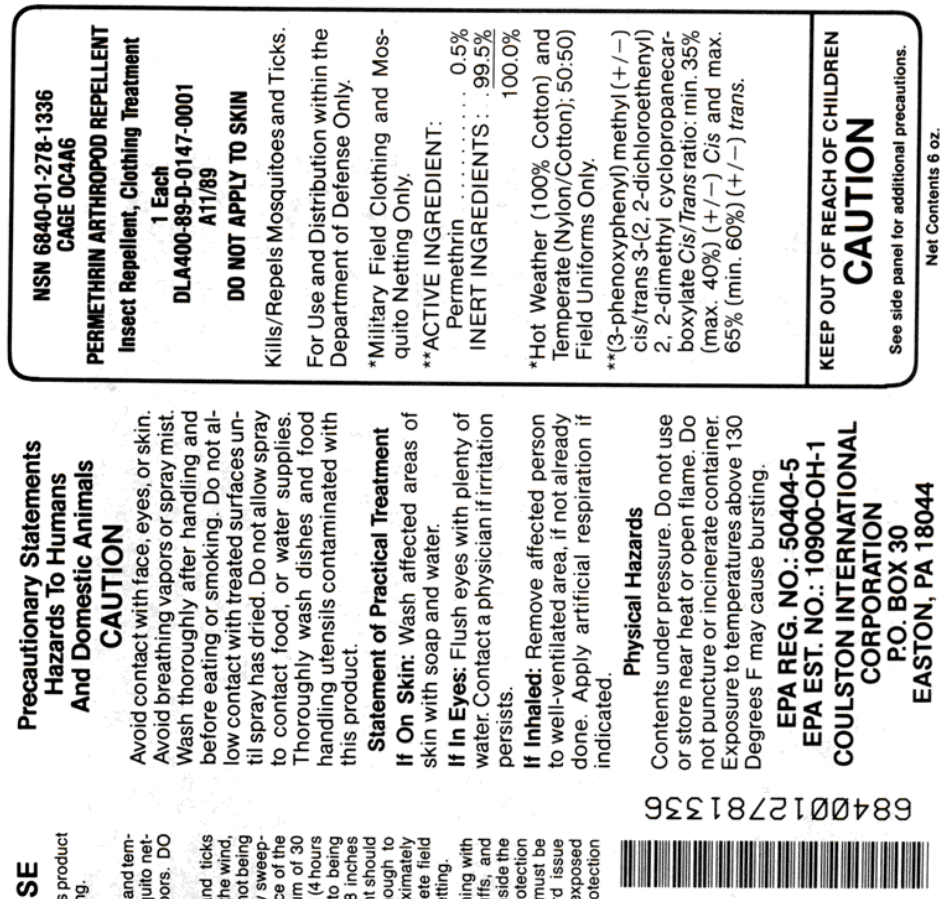
(2) Aerosol Spray

(Insect Repellent, Clothing Application, Aerosol, Permethrin Arthropod Repellent, NSN 6840-01-278-1336)

(a) This product contains 0.5-percent permethrin in a 6-ounce can (Figures 2-18 and 2-19). It can be used by the individual to treat military field uniforms (Figures 2-20), as well as head net (Figure 2-21) and mosquito netting (bed net, Figure 2-22). **DO NOT TREAT THE UNDERWEAR OR CAP**. This aerosol formulation of permethrin is also available commercially under several different trade names.

Figure 2-18. Permethrin Aerosol, NSN 6840-01-278-1336, 6-Ounce Can 0.5 -Percent Permethrin

Figure 2-19. DoD Label for Permethrin Aerosol Can, NSN 6840-01-278-1336



DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

SHAKE WELL BEFORE USING.

To be used for treatment of hot weather and temperate military field clothing and mosquito netting only. Make all applications outdoors. DO NOT TREAT UNIFORM CAP.

For protection against mosquitoes and ticks select an outdoor area protected from the wind, spray outer surfaces of clothing (while not being worn) and mosquito netting with a slow sweeping motion to lightly moisten the surface of the fabric. Treat the clothing for a minimum of 30 seconds on each side and allow 2 hours (4 hours under humid conditions) to dry prior to being worn. Hold can at a distance of 6 to 8 inches from the object being treated. Treatment should moisten the surface of the fabric enough to cause a slight color change. Use approximately ¾ of this container to treat one complete field uniform. Use remainder on mosquito netting.

Treat the entire outside surface of clothing with special attention to socks, trouser cuffs, and shirt cuffs. Pant cuffs should be worn inside the socks or footwear to ensure full protection against ticks and chiggers. This item must be used in conjunction with the standard issue repellent approved for application to exposed skin areas to achieve maximum protection from mosquitoes. Follow standard field uniform laundering procedures weekly. Reapply after six weeks and sixth laundering.

DISPOSAL: Replace cap, wrap container in several layers of newspaper. Discard in trash. Do not incinerate or puncture. In field situations bury the container.

Precautionary Statements
Hazards To Humans
And Domestic Animals
CAUTION

Avoid contact with face, eyes, or skin. Avoid breathing vapors or spray mist. Wash thoroughly after handling and before eating or smoking. Do not allow contact with treated surfaces until spray has dried. Do not allow spray to contact food, or water supplies. Thoroughly wash dishes and food handling utensils contaminated with this product.

Statement of Practical Treatment

If On Skin: Wash affected areas of skin with soap and water.

If In Eyes: Flush eyes with plenty of water. Contact a physician if irritation persists.

If Inhaled: Remove affected person to well-ventilated area, if not already done. Apply artificial respiration if indicated.

Physical Hazards

Contents under pressure. Do not use or store near heat or open flame. Do not puncture or incinerate container. Exposure to temperatures above 130 Degrees F may cause bursting.

EPA REG. NO.: 50404-5
EPA EST. NO.: 10900-OH-1
COULSTON INTERNATIONAL CORPORATION
P.O. BOX 30
EASTON, PA 18044

6840012781356

NSN 6840-01-278-1336
CAGE 0C4A6
PERMETHRIN ARTHROPOD REPELLENT
Insect Repellent, Clothing Treatment
1 Each
DLA400-89-D-0147-0001
A11/89
DO NOT APPLY TO SKIN

Kills/Repels Mosquitoes and Ticks.

For Use and Distribution within the Department of Defense Only.

*Military Field Clothing and Mosquito Netting Only.

**ACTIVE INGREDIENT:
Permethrin 0.5%
INERT INGREDIENTS: . . 99.5%
100.0%

*Hot Weather (100% Cotton) and Temperate (Nylon/Cotton); 50:50) Field Uniforms Only.

**(3-phenoxyphenyl) methyl (+/−) cis/trans 3-(2, 2-dichloroethenyl) 2, 2-dimethyl cyclopropanecarboxylate *Cis/Trans* ratio: min. 35% (max. 40%) (+/−) *Cis* and max. 65% (min. 60%) (+/−) *trans*.

KEEP OUT OF REACH OF CHILDREN
CAUTION
See side panel for additional precautions.
Net Contents 6 oz.

Figure 2-19. Department of Defense Label for 0.5-Percent Permethrin Aerosol, Insect Repellent, Clothing Treatment, NSN 6840-01-278-1336

(b) All applications should be made outdoors. Select a location protected from the wind. Shake well before using. Holding the can at a distance of 6 to 8 inches from the clothing (while not being worn), spray with a slow, sweeping motion.

(1) Spray the outer surfaces of the uniform, back and front, until the surface of the fabric appears moistened and a slight color change is noted (the original color will be restored when the uniform dries). Treat the shirt/blouse/coat and then the trousers, each for a minimum of 30 seconds on each side. Pay particular attention to the trouser cuffs and the shirt cuffs. Use approximately three-fourths of the can to treat one complete field uniform.

(2) The outer surface of the socks may also be **LIGHTLY** sprayed, regardless of whether they are cotton, wool, or a synthetic. The most critical areas are the top and front portions of the socks. This will aid in protecting against chiggers and tiny immature ticks which may find their way through the boot eyelets. The top edge and eyelet areas of the boot itself may also be lightly sprayed. The remainder can be used to treat mosquito netting.

(3) Allow the uniform to dry completely before being worn. This takes approximately 2 hours (or up to 4 hours under humid conditions). If possible, and if time permits, allow to dry in a shaded area because sunlight hastens degradation of permethrin. Permethrin has no odor once dry. Follow standard field uniform laundering procedures weekly. Reapply after 6 weeks or the sixth laundering, whichever comes first. **REMEMBER THAT DRY-CLEANING WITH CHLOROFLUOROCARBON-BASED SOLVENTS (CFCs) WILL COMPLETELY REMOVE PERMETHRIN.**[37] However, dry-cleaning with perchlorethylene, will **NOT** remove permethrin.

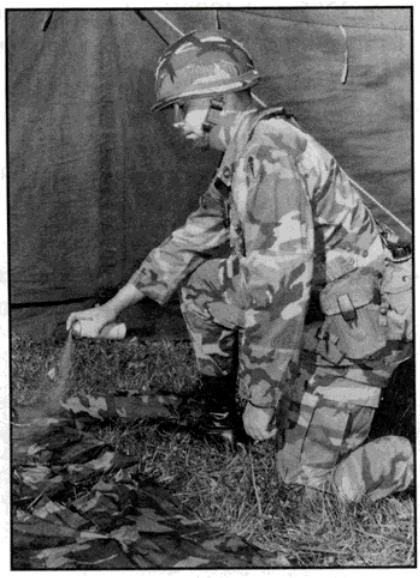


Figure 2-20. Applying Permethrin Aerosol to the Field Uniform

Figure 2-21. Applying Permethrin Aerosol to Insect Head Net

(c) Storage and disposal.

(1) The aerosol should be stored at temperatures between 32^0F and 130^0F. At temperatures above 130^0F there is increased chance of the can bursting. At temperatures below 32^0F, permethrin will begin to crystallize out of solution, although upon return to temperatures of 60-80^0F, it re-dissolves with no apparent effect on the quality of the product.[40] Under optimum storage conditions, the shelf-life of the aerosol is indefinite. If deterioration of the can, leakage of the contents, or loss of propellant is detected prior to this time, turn in the product for proper disposal. Cans should be checked carefully after 5 years to ensure that they are still functional.[39]

(2) After the contents of the can have been dispensed, replace the cap, wrap the container in several layers of newspaper and discard in the trash per label instructions. Do not puncture or incinerate. In contingency situations, dispose of in accordance with operational guidance.

(3) This product is **NOT** flammable, and may be safely carried aboard aircraft. Refer to DOT regulations for detailed guidance.[8]

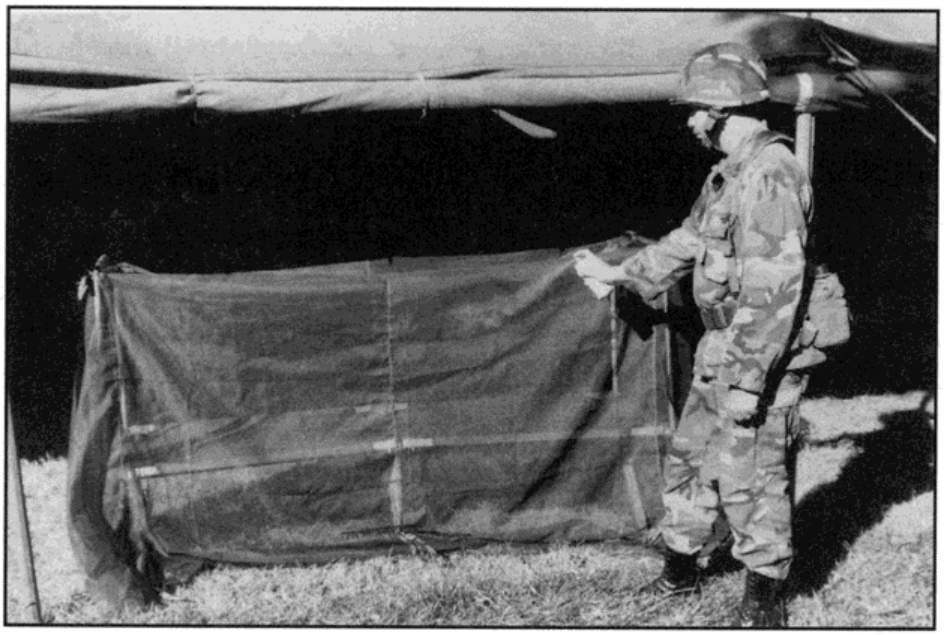


Figure 2-22. Applying Permethrin Aerosol to Insect Net Protector (Mosquito Bed Net)

(3) 5.1-Ounce (151 ml) Bottle

(Insect Repellent, Clothing Application, Permethrin, 40-Percent Liquid, 2-Gallon Sprayer NSN 6840-01-334-2666).

(a) This product contains 40-percent permethrin EC (Figure 2-23). In accordance with its label, **IT IS FOR USE BY CERTIFIED OR TRAINED PERSONNEL ONLY**.[44] It can be applied to military field uniforms, netting, and tentage. **NOTE:** Treatment of BDUs with this product results in runoff of the chemical. Wear appropriate personal protective equipment (e.g., respirator, gloves, etc.) when applying permethrin using this method. Ensure appropriate steps are taken to ensure the environment, particularly water sources, are not contaminated due to spraying operations.

(b) Several steps are essential in properly using this product. Wear protective gloves and a respirator when mixing and applying this formulation. Thoroughly clean a 2-gallon sprayer (see Table 2-1) by triple-rinsing with water. Add 1 gallon of clean water to the sprayer, followed by the entire contents of the 5.1 ounce bottle; then add a second gallon of water. This procedure helps to mix the water and permethrin. Agitate and bring to a pressure of 55 pounds per square inch (psi) (The 2-gallon sprayer, NSN 3740-00-641-4719, now comes equipped with a pressure gauge). When retrofitting older sprayers, use NSN 3740-01-332-8746, gauge, pressure, and NSN 4330-01-332-1639, filter, gauge (see Table 2-1). The maximum working pressure of the 2-gallon sprayer is 55 psi, and 40-55 full hand strokes are generally required to reach this working pressure. The required pressure can also be estimated by pumping the sprayer to maximum firmness (pumping will become very difficult). As soon as spraying begins, the pressure will progressively drop, requiring frequent re-pressurizations.

Figure 2-23. Permethrin 5.1-Ounce (151-ml) Bottle, NSN 6840-01-334-2666

Insect Repellent, Clothing Application, Permethrin, 40-Percent Liquid, 2-Gallon Sprayer

(c) To treat clothing (Figure 2-24), place the uniforms on the ground and spray each uniform at a distance of 12-18 inches using a coarse fan nozzle at 55 psi. Spray evenly until the fabric is very wet (a color change will be noted). This will require spraying the shirt and trousers separately, each for approximately 50 seconds on each side (total of 200 seconds for one whole uniform). One bottle of permethrin (diluted with water in a 2-gallon sprayer) is enough to treat eight complete uniforms. Hang the uniforms until they are dry (usually 2-4 hours, during which time the original color will be restored). Once dry, permethrin has no odor and does not affect the appearance of the fabric, and the garments may be safely handled and worn. This procedure impregnates 8 sets of uniforms with permethrin at the rate of 0.125 mg/cm^2. Permethrin is bound so strongly to the fabric by this procedure that water will not remove it: **PERMETHRIN WILL NOT WASH OUT OF TREATED UNIFORMS IN THE RAIN OR WHEN FORDING STREAMS, ETC.**

(d) **DO NOT RE-TREAT THE UNIFORMS**: one treatment is effective in preventing mosquito bites through the fabric for the life of the uniform. **DO NOT TREAT THE UNDERWEAR OR THE CAP. DRY-CLEANING WITH CHLOROFLUOROCARBON-BASED SOLVENTS (CFCs) WILL COMPLETELY**

REMOVE PERMETHRIN.[37] However, dry-cleaning with perchlorethylene will **NOT** remove permethrin.

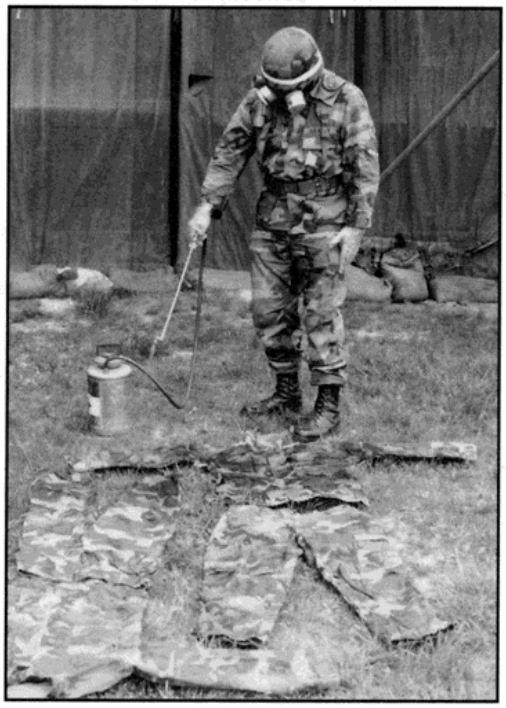


Figure 2-24. Applying Permethrin by 2-Gallon Sprayer to Multiple Field Uniforms

(e) To treat netting (Figure 2-25), spread the netting on the ground and spray at a distance of 12-18 inches using a coarse fan nozzle at 55 psi. Spray with a slow sweeping motion to completely cover the netting fabric without runoff. Allow to dry completely before using. Re-treat after 1 year of use or six launderings.[36] Bednets that have been stored immediately following treatment will retain their effectiveness for many years prior to use.

(f) To treat tentage that has not been coated with a water-repellent finish (Figure 2-26), erect the tent and treat the entryways and the inside surface (ceiling, walls and floor) as this is where pests are most likely to rest. Spray at a distance of 12-18 inches using a fan nozzle at 55 psi. Direct the spray to the walls, ceilings, and floor (if present) with a slow sweeping motion just to the point of runoff. Permethrin is compatible with the fire retardants and mildew inhibitors used on general purpose, temper, and Arctic tents, as well as cotton tent liners.[29] Re-treat after 9 months of use in temperate climates and after 6 months of use in tropical climates.[36] Tents that have been stored following treatment will retain their effectiveness for many years prior to use. **PERMETHRIN SOLUTIONS ARE INEFFECTIVE ON VINYL-COATED TEMPER TENTS**, as the water-based permethrin will simply drip off of the water-repellent surface. In this case, it becomes even more important to use treated bednets. Permethrin-impregnated tents are commercially available, and may eventually be adapted for military use.

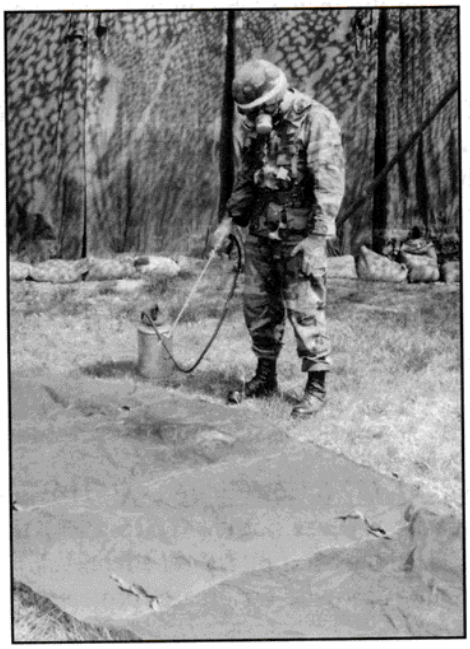


Figure 2-25. Applying Permetrhin by 2-Gallon Sprayer to Insect Net Protector (Mosquito Bed Net)

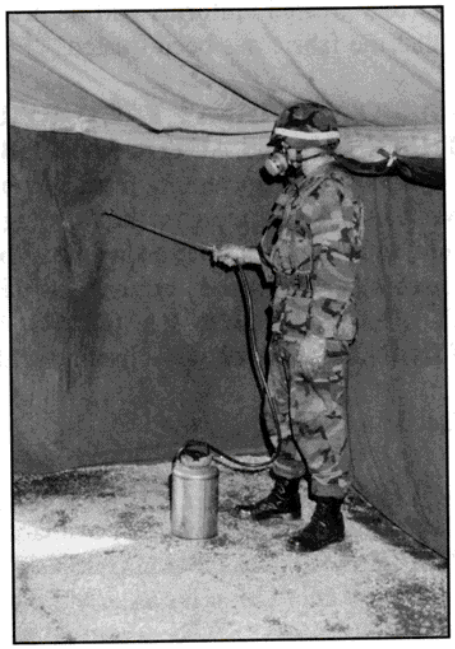


Figure 2-26. Applying Permetrhin by 2-Gallon Sprayer to Internal Surface of a Tent

(g) Storage and disposal.

(1) Do not store products containing permethrin EC below 32^0F, because the permethrin will crystallize. However, the integrity of the product is restored when it is thawed, brought back to ambient temperature, and agitated until all the crystals redissolve. The flash point of 40-percent permethrin EC is 115^0F due to the flammable solvent used in the formulation. Although the product shows little or no decomposition at 122^0F after 30 days, storing the product in an enclosed space at or above 115^0F will increase the chance of explosion due to ignition of vapors.[40] Under optimum conditions, the shelf-life of this product is indefinite. If deterioration of the container, and/or leakage of the contents, is detected prior to this time, turn in the product for proper disposal.[39]

(2) When empty, the pesticide container should be recapped, placed in a plastic bag, and discarded in the trash per label instructions. In contingency situations, dispose of in accordance with operational guidance.

(3) This product is flammable and must be shipped in accordance with DOT regulations.[8]

(4) Factory Impregnation of BDUs

(a) In this method, BDUs are factory-treated with permethrin prior to distribution. Factory-treated uniforms bear a unique label with a statement indicating that the fabric has been treated. Treated uniforms will not replace untreated uniforms, but will be available for distribution from contingency stocks, or on order from the Defense Supply Center Philadelphia (DSN 444-5608). A list of the NSNs for factory treated BDUs is at Appendix D.

(b) **DO NOT TREAT FACTORY-IMPREGNATED UNIFORMS WITH ADDITIONAL PERMETHRIN:** the original factory treatment is effective in preventing mosquito bites through the fabric for the life of the uniform. **REMEMBER THAT DRY-CLEANING WITH CHLOROFLUOROCARBON-BASED SOLVENTS (CFCs) WILL COMPLETELY REMOVE PERMETHRIN.**[37] However, dry-cleaning with perchlorethylene, will **NOT** remove permethrin.

2-10. Miscellaneous Repellent.

Chigg-Away (Insect Repellent, Personal Application, NSN 6840-01-137-8456)(Figure 2-27) is a yellow lotion with a sulfurous odor, which is available in a 188-ml plastic squeeze bottle. **THIS PRODUCT IS ONLY MEANT TO PROTECT AGAINST CHIGGERS AND SO IS NOT RECOMMENDED FOR USE IN MOST SITUATIONS.** The standard military repellents (extended-duration DEET lotion for skin and permethrin for clothing) provide far greater protection.

Figure 2-27. Chigg-Away, NSN 6840-01-137-8456, Insect Repellent, Personal Application

a. Chigg-Away contains 3-percent benzocaine to relieve itching caused by chigger and other insect bites, and 10-percent precipitated sulfur to repel chiggers. To relieve itching, it can be applied directly to the bites of chiggers, mosquitoes, ticks, sand fleas and biting flies, or to skin irritation caused by poison ivy/oak and sunburn. As a repellent, it should be applied around

feet, ankles, waist and to skin under all areas of light clothing, and around all openings in outer clothing. This product washes off easily, so reapply after heavy perspiration.

b. Do not apply this product to the eyes or other mucous membranes; it is not for prolonged use.

c. Storage and Disposal.

(1) The shelf life of Chigg-Away is approximately 4 years. An expiration date is stamped on the container. It should be stored at room temperature, not above 100^0F, and should be kept from freezing. This product contains no hazardous ingredients. It is non-flammable and non-reactive.[42]

(2) The empty bottle should be rinsed with tap water and discarded in the trash. In contingency situations, the container can be disposed of in the same manner as other non-hazardous trash.

2-11. DoD Insect Repellent System

The **BEST STRATEGY** for defense against insects and other diseases-bearing arthropods is the **DOD INSECT REPELLENT SYSTEM** (Figure 2-28). This system includes the application of extended-duration DEET lotion to exposed skin, coupled with the application of permethrin to the field uniform. When used with a properly-worn uniform, the DoD insect repellent system will provide nearly complete protection from arthropod-borne diseases. Also, remember to **PERFORM ROUTINE TICK CHECKS.**

Figure 2-28. DoD Insect Repellent System

Section V. Mechanical Modifications

2-12. Clear Leaf Litter and Underbrush

Clear away leaf litter and underbrush that provide habitat for arthropods, and forage and harborage for animal hosts. Raking is simple and efficient. Keep grass and weeds mowed back where possible, especially around buildings, and in housing, cantonment and recreational areas. For large areas, controlled burning of the under story may be necessary. This latter method requires considerable expertise and careful planning. It should only be attempted by trained personnel when other methods fail or are impractical, and after authorization has been obtained through appropriate environmental and medical channels.

2-13. Eliminate Accumulated Water

Mosquito breeding sites should be eliminated or reduced by draining standing water, and by preventing water accumulation in containers, depressions in the ground, or other receptacles.

Section VI. Sanitation

2-14. Importance

Although not primarily a personal protective measure, it is the responsibility of each individual to participate in the overall unit sanitation effort. Once a bivouac site is established, sanitation is important. Garbage and other odiferous decaying matter will attract arthropods and other animal pests and should not be allowed to accumulate. These types of materials should be maintained in tightly closed containers, or should be buried, burned, or removed.

Section VII. Pesticides

2-15. Applications

Pesticide treatment may be necessary when troops are to remain for a prolonged period of time in an area that is heavily infested with arthropods. Pesticide applications must only be performed by trained or certified individuals, and only after PVNTMED personnel determine that other protective and preventive measures are, or will not be, fully successful. Aerial applications can be used for large areas, and should be conducted prior to deployment into the site. They must be conducted according to all applicable environmental laws and regulations.

2-16. Reduce Pesticide Use

Current DoD environmental policy stresses a concentrated attempt to drastically reduce pesticide dispersal within military programs.[26] As a part of this overall effort, use of the **DOD INSECT REPELLENT SYSTEM** will help to reduce the need for pesticide applications during contingency operations, as well as during routine training activities. The link between repellent use and reduced need for pesticide dispersal is nothing new, but has become increasingly more important in this era of enlightened environmental stewardship.

Section VIII. Ineffective and Hazardous Practices

2-17. Introduction

A number of commercial products which are either not marketed for personal protection, or are not very effective repellents, are nevertheless being widely used by troops for this purpose. Such products are less effective than those containing DEET, and they may be hazardous when used in a manner not approved by the label. Products with concentrations in the range of about 20% to 40% DEET provide an appropriate mix of effectiveness and duration of protection. Within this range of concentration, percent active ingredient generally translates to duration of protection. Products with less than 20% DEET provide protection for too short a period of time to be useful in military scenarios. Above 40% DEET, the gain in duration of protection is generally not great enough to warrant using the higher concentration products. Medical personnel should instruct troops on the correct use of appropriate personal protective measures and should strictly prohibit the use of unauthorized products.

2-18. Commercial Products

a. Non-DEET Products

Many new products that are advertised as repellents generally do not contain DEET, may use active ingredients that are not proven repellents or have very little repellency (e.g., bath oils and some so-called natural products), may contain repellent ingredients at such low concentration they are ineffective (e.g., citronella), and may actually be hazardous to use on humans (e.g., flea and tick collars; see discussion below). While many of these products may provide some protection over a short period of time under low pest biting pressure (e.g., backyard barbecues), they are not sufficient to protect personnel in the field against pests that may carry disease.

b. Ingested Products

Some products or publications make claims that ingesting certain materials will protect you from insect bites. There is no scientific evidence that any material that is ingested (e.g., match heads, vitamin B1, etc.) has any repellent effect on insects or other biting arthropods.

c. Flea and Tick Collars

Some troops have used animal flea and tick collars around their wrists, ankles, arms, or belt lines. These collars are not intended for human use so their safety has never been tested on humans. Such products contain many different kinds of pesticides which may have adverse dermal and/or systemic effects on people. Severe skin reactions have been reported (Figure 2-29). In addition, some pesticides contained in these collars could trigger chemical agent detectors.

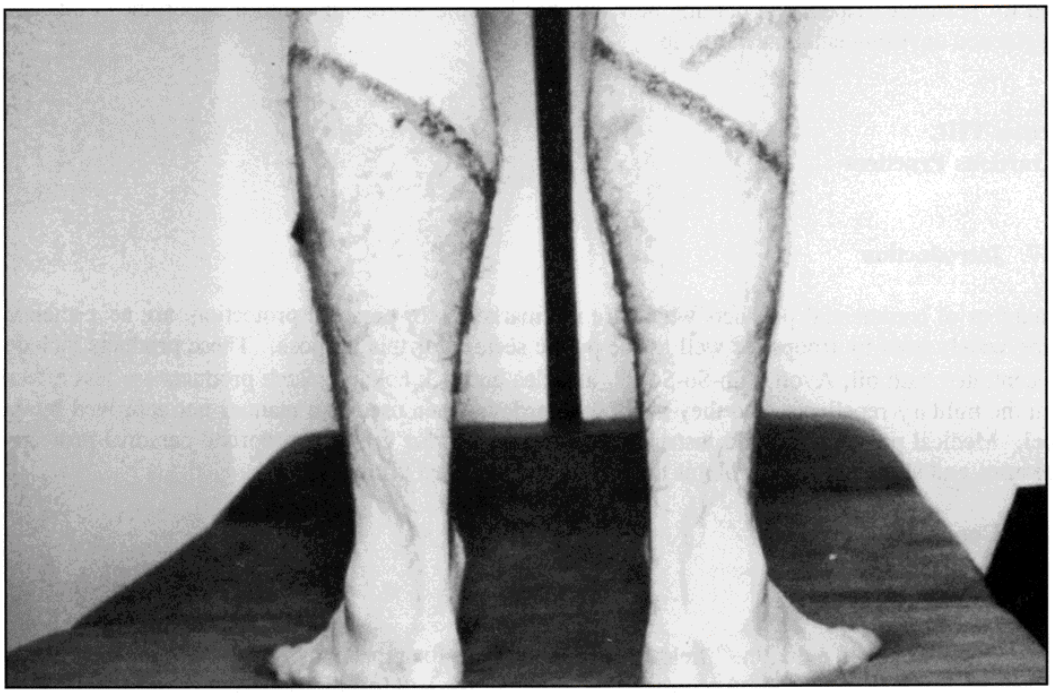


Figure 2-29. Skin Lesions on the Legs Caused by Human Use of Flea and Tick Collars

Section IX. Conclusion

2-19. Summary

Conscientious use of the **DOD INSECT REPELLENT SYSTEM**, and the other techniques described in this TIM, will provide maximum, safe protection from arthropod attack.

2-20. Training Package

Since many technical details are presented and interspersed throughout this document, a summary of the pertinent points will be useful as a training tool. See Appendix E for a sample training package which can be presented by way of viewgraphs. Slides, charts, or other appropriate media.

A APPENDIX - REFERENCES

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B APPENDIX - SUGGESTED IMPROVEMENTS FORM

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* DPMIAC, Armed Forces Pest Mangement Board Forest Glen Section, WRAMC Washington, DC 20307-5001	FROM: *(Activity and location) (Include ZIP Code)*	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

DA FORM 1FEB74 2028 REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED. USAPPC V1.00

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

USAPPC V1.00

C APPENDIX - TICK REMOVAL

1. **REMOVE TICKS PROMPTLY**.

a. If a tick is found attached to the body, seek assistance from medical authorities for proper removal, or follow these guidelines (See Figures 1-3 below)

(1) **Grasp the ticks' mouthparts** against the skin, using pointed tweezers (Figure 2).

(2) **Pull back** slowly and steadily with firm tension.

(a) Pull in the reverse of the direction in which the mouthparts are inserted, as you would for a splinter.

(b) **BE PATIENT** -- The long, central mouthpart (called the hypostome) is inserted in the skin. It is covered with sharp barbs, sometimes making removal difficult and time consuming (Figure 3, inset).

(c) Most hard ticks secrete a cement-like substance during feeding. This material helps secure their mouthparts firmly in the flesh and adds to the difficulty of removal.

(d) It is important to continue to pull steadily until the tick can be eased out of the skin (Figure 3).

(e) **DO NOT** pull back abruptly, as this may tear the mouthparts from the body of the tick, leaving them embedded in the skin. If this happens, do not panic. Embedded mouthparts are comparable to having a splinter in your skin. However, to prevent the chance of secondary infection, it is best to remove them. Seek medical assistance if necessary.

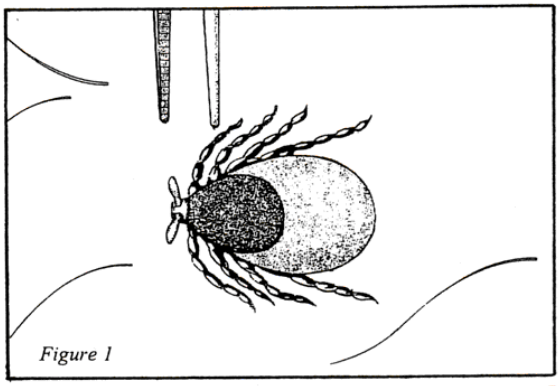


Figure 1

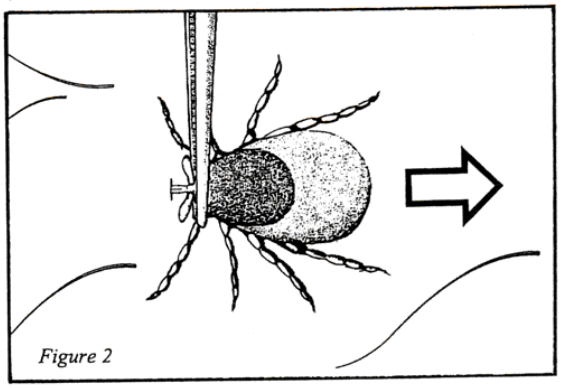


Figure 2

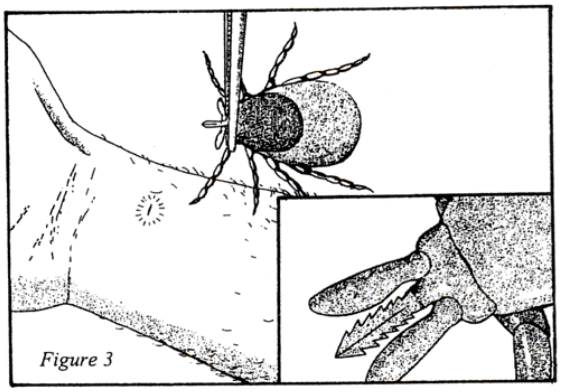


Figure 3

(f) **DO NOT** squeeze or crush the body of the tick because this may force infective body fluids through the mouthparts and into the wound.

(g) **DO NOT** apply substances such as petroleum jelly, finger nail polish, finger nail polish remover, repellents, pesticides, or a lighted match to the tick while it is attached. These materials are either ineffective, or worse, might agitate the tick and cause it to salivate or regurgitate infective fluid into the wound site.

(3) If, and only if, tweezers are not available, grasp the ticks' mouthparts between your fingernails and remove the tick carefully by hand being sure not to squeeze the body of the tick. Be sure to wash your hands and under your fingernails to prevent possible contamination by infective material from the tick.

2. Following removal of the tick, **wash the wound** (and your hands) with soap and water, and **apply an antiseptic**.

3. **Save the tick** in a jar, vial, small plastic bag, or other container for identification should you later develop disease symptoms. Preserve the tick by either adding some alcohol to the jar or by keeping it in the freezer. Storing a tick in water will not preserve it. Identification of the tick may help the physician make diagnostic and treatment decisions as many tick-borne diseases are transmitted only by certain species.

4. **Discard** the tick after one month; all known tick-borne diseases will generally cause symptoms within this time period.

D APPENDIX - NSNs FOR FACTORY TREATED INSECT REPELLENT BDUs

BDU Type IX: Insect Repellent Treated *Woodland Temperate* BDUs

BDU Type X: Insect Repellent Treated *Woodland Camouflage* BDUs

BDU Type XI: Insect Repellent Treated *Desert Camouflage* BDUs

BDU Type IX: Insect Repellent Treated *Woodland Temperate* BDUs

TROUSERS		***COAT***	
SIZE-LENGTH	**NSN**	**SIZE-LENGTH**	**NSN**
XS-XS	8415-01-458-9465	XS-XS	8415-01-458-8028
XS-S	8415-01-458-9495	XS-S	8415-01-458-8666
XS-R	8415-01-458-9518	XS-R	8415-01-458-8674
XS-L	8415-01-458-9523	S-XXS	8415-01-458-9218
S-XS	8415-01-459-0012	S-XS	8415-01-458-8678
S-S	8415-01-459-0030	S-S	8415-01-458-8693
S-R	8415-01-459-0035	S-R	8415-01-458-8709
S-L	8415-01-459-0048	S-L	8415-01-458-8716
S-XL	8415-01-459-0058	S-XL	8415-01-458-8720
M-XS	8415-01-459-0064	M-XXS	8415-01-458-9229
M-S	8415-01-459-0132	M-XS	8415-01-458-9012
M-R	8415-01-459-0117	M-S	8415-01-458-9017
M-L	8415-01-459-0976	M-R	8415-01-458-9020
M-XL	8415-01-459-0940	M-L	8415-01-458-9028
M-XXL	8415-01-459-0943	M-XL	8415-01-458-9033
L-S	8415-01-459-0946	L-XS	8415-01-458-9054
LR	8415-01-459-0957	L-S	8415-01-458-9092
L-L	8415-01-459-0969	L-R	8415-01-458-9095
L-XL	8415-01-459-0981	L-L	8415-01-458-9108
L-XXL	8415-01-459-0991	L-XL	8415-01-458-9113
XL-S	8415-01-459-0997	XL-R	8415-01-458-9141
XLR	8415-01-459-1006	XL-L	8415-01-458-9163
XL-L	8415-01-459-1026		
XXL-XXL	8415-01-459-1076		

BDU Type X: Insect Repellent Treated *Woodland Camouflage* BDUs

TROUSERS		***COAT***	
SIZE-LENGTH	**NSN**	**SIZE-LENGTH**	**NSN**
XS-XS	8415-01-453-4039	XS-XS	8415-01-453-7794
XS-S	8415-01-453-4610	XS-S	8415-01-453-7802
XS-R	8415-01-453-4614	XS-R	8415-01-453-7806
XS-L	8415-01-453-4639	XS-L	8415-01-453-7905
S-XS	8415-01-453-4644	S-XXS	8415-01-453-7917
S-S	8415-01-453-4646	S-XS	8415-01-453-7963
S-R	8415-01-453-4647	S-S	8415-01-453-7995
S-L	8415-01-453-4692	S-R	8415-01-453-8012
M-XS	8415-01-453-4700	S-L	8415-01-453-8018
M-S	8415-01-453-4712	S-XL	8415-01-453-8063
M-R	8415-01-453-4785	M-XXS	8415-01-453-8067
M-L	8415-01-453-4830	M-XS	8415-01-453-8236
M-XL	8415-01-453-4862	M-S	8415-01-453-8284
M-XXL	8415-01-453-5092	M-R	8415-01-453-8292
L-S	8415-01-453-5223	M-L	8415-01-453-8300
L-R	8415-01-453-5236	M-XL	8415-01-453-8304
L-L	8415-01-453-5245	M-XXL	8415-01-453-8610
L-XL	8415-01-453-5251	L-XS	8415-01-453-8616
L-XXL	8415-01-453-5255	L-S	8415-01-453-8625
XL-S	8415-01-453-7735	L-R	8415-01-453-8636
XL-R	8415-01-453-7741	L-L	8415-01-453-8642
XL-L	8415-01-453-7748	L-XL	8415-01-453-8645
XL-XL	8415-01-453-7762	L-XXL	8415-01-453-8648
XL-XXL	8415-01-453-7772	XL-S	8415-01-453-8676
		XL-R	8415-01-453-8677
		XL-L	8415-01-453-8680

BDU Type XI: Insect Repellent Treated *Desert Camouflage* BDUs

TROUSERS		***COAT***	
SIZE-LENGTH	**NSN**	**SIZE-LENGTH**	**NSN**
XS-XS	8415-01-453-2860	XS-XS	8415-01-453-1348
XS-S	8415-01-453-3008	XS-S	8415-01-453-1393
XS-R	8415-01-453-3035	XS-R	8415-01-453-1435
XS-L	8415-01-453-3045	XS-L	8415-01-453-1454
S-XS	8415-01-453-3209	S-XXS	8415-01-453-1478
S-S	8415-01-453-3219	S-XS	8415-01-453-1496
S-R	8415-01-453-3226	S-S	8415-01-453-2034
S-L	8415-01-453-3239	S-R	8415-01-453-2036
M-XS	8415-01-453-3290	S-L	8415-01-453-2047
M-S	8415-01-453-3306	S-XL	8415-01-453-2054
M-R	8415-01-453-3313	M-XXS	8415-01-453-2128
M-L	8415-01-453-3318	M-XS	8415-01-453-2135
M-XL	8415-01-453-3322	M-S	8415-01-453-2153
M-XXL	8415-01-453-3333	M-R	8415-01-453-2179
L-S	8415-01-453-3340	M-L	8415-01-453-2298
L-R	8415-01-453-3347	M-XL	8415-01-453-2301
L-L	8415-01-453-3354	M-XXL	8415-01-453-2472
L-XL	8415-01-453-3762	L-XS	8415-01-453-2482
L-XXL	8415-01-453-3824	L-S	8415-01-453-2547
XL-S	8415-01-453-3863	L-R	8415-01-453-2577
XL-R	8415-01-453-3869	L-L	8415-01-453-2619
XL-L	8415-01-453-3873	L-XL	8415-01-453-2628
XL-XL	8415-01-453-3998	L-XXL	8415-01-453-2636
XL-XXL	8415-01-453-4024	XL-S	8415-01-453-2821
		XL-R	8415-01-453-2832
		XL-L	8415-01-453-2855

E APPENDIX - TRAINING PACKAGE

PERSONAL PROTECTIVE TECHNIQUES

AGAINST ARTHROPODS

VIEWGRAPH 1

IMPORTANCE OF PROTECTION

- **Historically, more combat power has been lost due to disease and non-battle injuries (DNBI) than from direct combat casualties**

- **Many of these diseases are transmitted by arthropods**

ARTHROPODS INFLICT STRESSES THAT THREATEN THE MILITARY MISSION

- **Physical - disease, painful bites, infections, dermatitis, allergic reactions**

- **Psychological - fear of arthropods, their bites, or disease**

- **Economic - Extensive medical care costs and loss of manpower**

MAJOR ARTHROPOD PESTS/ DISEASES OF MILITARY IMPORTANCE

- **Biting midges - visceral filariasis, Oropouche fever**
- **Black flies - Onchocerciasis**
- **Body lice - epidemic typhus, relapsing fever**
- **Deer flies - Eye worm disease**
- **Fleas - plague, murine typhus**
- **Kissing bugs - Chagas' disease**

MAJOR PESTS/DISEASES (CONT.)

- **Mites - scrub typhus, scabies, rickettsialpox**
- **Mosquitoes - malaria, dengue, viral encephalitis**
- **Sand flies - sand fly fever, leishmaniasis**
- **Ticks - RMSF, Lyme disease, babesiosis**
- **Tsetses - African sleeping sickness**

MECHANICAL DISEASE TRANSMISSION BY FILTH FLIES

- X **Dysentery**
- X **Cholera**
- X **Salmonella**
- X **Shigellosis**
- X **Typhoid fever**

METHODS OF PROTECTION

- **Avoidance**
- **Physical barriers**
- **Repellents**
- **Mechanical modifications**
- **Sanitation**
- **Pesticides**

AVOID THE KNOWN HABITAT OF ARTHROPODS

- **Use pest surveillance information from medical and intelligence personnel**
- **Choose bivouac sites that are dry, open, and uncluttered**
- **Avoid rodent burrows, local settlements, animal pens**
- **Limit contact with indigenous human populations**

EMERGENCY REQUISITION OF REPELLENTS AND PESTICIDES

Emergency Supply Operations Center (ESOC), Defense Supply Center of Richmond (DSCR), Richmond, VA

DSN 695-4865; CM (804) 279-4865

24 hours/day; 7 days/week

PHYSICAL BARRIERS

- **Clothing**
- **Protective Equipment**

CLOTHING

X **Proper wearing of the field uniform**

X **Tuck pant legs into boots or socks**

X **Roll sleeves down**

X **Close collar**

X **Wear undergarments; tuck shirt into pants**

X **Wear field cap**

CLOTHING (CONT.)

- **Check clothing frequently for crawling arthropods (e.g., ticks)**
- **Buddy checks**
- **After undressing, check clothing and body**
- **Shower**

TICK REMOVAL

- **Use tweezers to grasp mouthparts at the skin**
- **Pull back slowly, steadily and firmly; be patient!**
- **DO NOT crush or squeeze body of tick**
- **DO NOT use hot matches, nail polish, petroleum jelly, pesticides, etc.**
- **Wash wound site and apply antiseptic**

X **Save tick for identification**

AVOID SNAKES, SPIDERS, SCORPIONS

- X **Wear socks inside shoes or boots**
- X **DO NOT walk around in bare or stocking feet**
- X **Shake out boots before putting on**
- X **Check concealed spaces before reaching into them**

PROTECTIVE EQUIPMENT

- **Head net - Treat netting with permethrin or DEET repellent**

- **Bed net - Treat with permethrin and use d-phenothrin inside erected bed net enclosure**

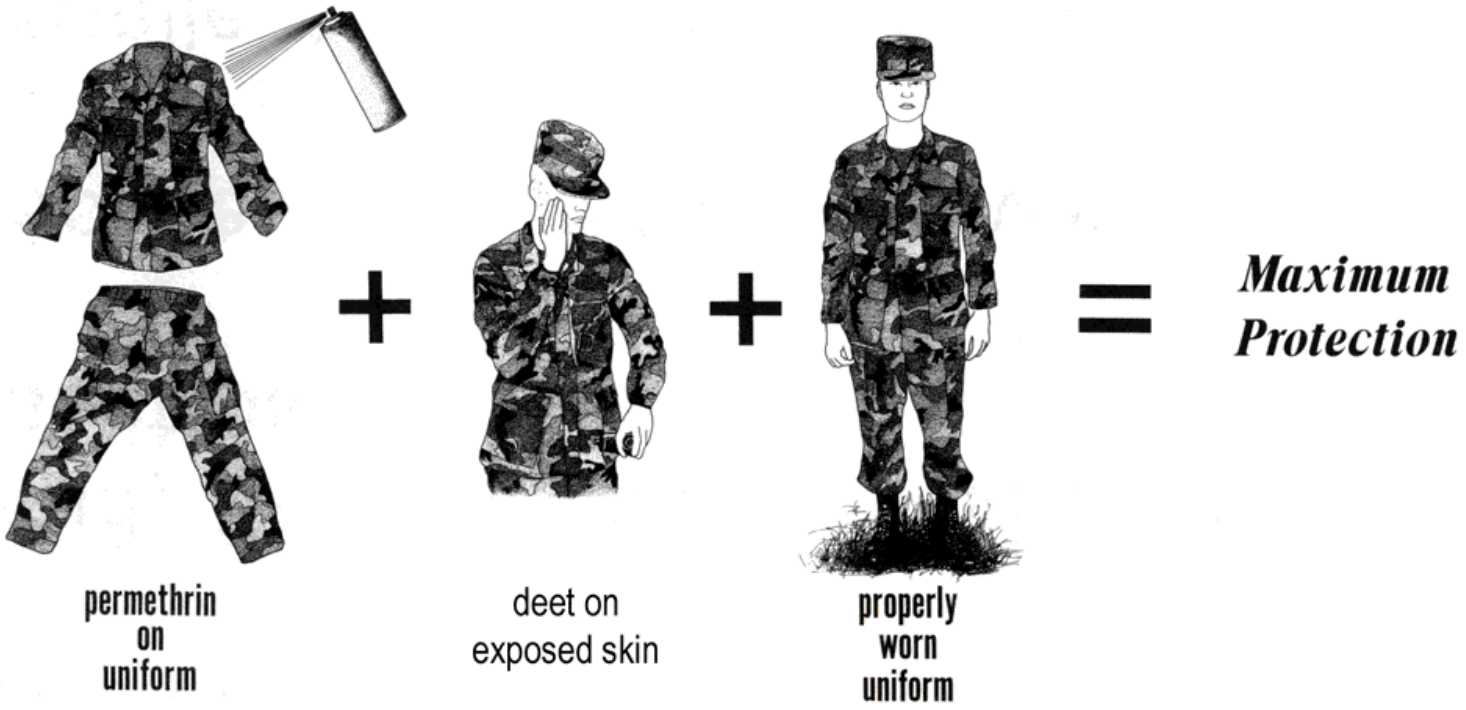
- **Tent screens - Keep light to a minimum at night**

REPELLENTS

- **Skin (DEET) - vapor-active repellent - STANDARD MILITARY SKIN REPELLENT**

- **Clothing (permethrin) - contact repellent; toxic to arthropods upon contact - STANDARD MILITARY CLOTHING REPELLENT**

DOD INSECT REPELLENT SYSTEM



DEET FORMULATIONS

- **Extended-duration DEET lotion, 2-ounce tube - 33 percent - STANDARD MILITARY SKIN REPELLENT – RECOMMENDED**
- **DEET liquid, 2-ounce bottle - 75 percent (for use with insect parka only)**
- **Insect repellent parka (use with 75% DEET liquid)**
- **Insect repellent stick (in survival kits)**
- **Insect repellent with sunscreen (in survival kits)**

STANDARD DEET LOTION

- **NSN 6840-01-284-3982**
- **Spread thin film over all exposed skin**
- **Safe**
- **Long-acting: provides 6 - 12 hours protection**
- **CAN be used with camouflage paint; apply DEET first**

STANDARD DEET LOTION (CONT.)

- X Does NOT affect seal of protective mask
- X Does NOT affect the infrared signature of the individual
- X Does NOT damage field uniform fabrics, nylon, or wool

PRECAUTIONS WHEN USING DEET

- X **DO NOT apply to eyes and lips**
- X **DO NOT apply to sensitive or damaged skin**
- X **DO NOT contact plastic, rubber, vinyl, or elastic**
- X **Standard lotion is stable; may leak above 140·F**
- X **75-percent liquid is highly flammable**
- X **DO NOT store 75-percent liquid formulation near calcium hypochlorite**

PERMETHRIN FORMULATIONS

- **Individual Dynamic Absorption (IDA) kit - 40 percent EC**

- **Aerosol spray, 6 ounce can: 0.5 percent**

- **5.1 ounce bottle - 40 percent emulsifiable concentrate (EC)**

- **Factory-treated permethrin BDUs**
  (NOTE: Available in addition to standard,untreated BDUs; <u>not</u> a basic issue item)

PERMETHRIN TREATMENT

- X **Field uniforms**
- X **Head nets**
- X **Bed nets**
- X **Tents and tent screens**
- X **Ground covers**
- X **Camouflage helmet covers**

PRECAUTIONS WHEN USING PERMETHRIN

- **Use ONLY on clothing**
- **DO NOT contaminate water - EXTREMELY TOXIC to fish, but LOW mammalian toxicity**
- **DO NOT treat underwear or cap**
- **Avoid breathing vapors**
- **Dry-cleaning with chlorofluorocarbon-based solvents (CFCs) will remove permethrin**

AEROSOL SPRAY
0.5 PERCENT PERMETHRIN

- **NSN 6840-01-278-1336**
- **For use by the individual**
- **Use 3/4 can on one complete field uniform**
- **Spray uniform at distance of 6-8 inches**
- **Spray 30 sec ea side of shirt & trousers (=2 min)**
- **Allow to dry before wearing**

AEROSOL SPRAY (CONT.)

- **Re-treat after 6 weeks or six launderings**
- **Use remainder on netting, etc.**
- **Non-flammable; may be carried aboard aircraft**
- **Shelf-life 5 years or more; dispose if deterioration of can, or leakage of contents detected prior to this time**

5.1-OUNCE BOTTLE
40-PERCENT PERMETHRIN EC

- X **NSN 6840-01-334-2666**
- X **For use by certified or trained personnel only**
- X **Wear respirator**
- X **Use 2-gallon sprayer with pressure gauge**
- X **Dilute in 2-gallons water; mix well**
- X **Pressurize to 55 psi**

5.1-OUNCE BOTTLE (CONT.)

- **Treat multiple field uniforms, bed nets, tents**
- **Use fan nozzle; spray item at a distance of 12-18 inches**
- **Flammable**
- **Shelf-life indefinite under optimum conditions;**
  Dispose if container deteriorates or leaks

TREATMENT REGIMENS FOR 2-GALLON SPRAYER METHOD

- **Clothing - Spray outside surfaces of front and back of the shirt and trousers until soaking wet (approx. 50 seconds per side per piece: total 200 seconds per uniform). DO NOT RE-TREAT UNIFORM: ONE TREATMENT EFFECTIVE FOR LIFE OF UNIFORM**
- **Netting - Fold bed net in half, spraying one side, then the other, to cover completely without runoff. RE-TREAT AFTER 1 YEAR OR SIX LAUNDERINGS**

2-GALLON SPRAYER REGIMENS (CONT)

- **Tentage - Treat entryways and the inside surface (walls, ceiling, floor) until the point of runoff. RE-TREAT AFTER 9 MONTHS IN TEMPERATE, OR 6 MONTHS IN TROPICAL CLIMATES.**

  - **Permethrin is ineffective on vinyl-coated tents.**

IDA KIT

- **NSN 6840-01-345-0237**

- **For use by individual**

- **Each kit contains: Two 3-ounce vials permethrin (40-percent EC), 2 treatment bags, two pieces twine, 1 pair disposable gloves, 1 marking pen**

- **Wear the protective gloves when mixing, and when handling wet, treated uniform**

- **Treat shirt and trousers separately**

IDA KIT (CONT.)

- Pour 3/4 canteen cup water in treatment bag
- Add contents of one bottle of permethrin to bag
- Seal bag and shake to mix
- Roll and tie garment and insert into bag
- Allow to sit for 3 hours to absorb permethrin
- Remove garment and hang until dry (2-4 hours)

IDA KIT (CONT.)

- **Mark waistband & collar 'Perm treat, mo/yr'**
- **Place used kit items into one bag. Dispose in trash or per operational guidance**
- **One treatment effective for life of uniform**
- **Flammable**
- **Shelf-life indefinite under optimum conditions; Dispose if deterioration or leakage is observed**

FACTORY TREATED BDUs

- **Factory treatment of BDUs prior to distribution**
- **Unique label identifies item as permethrin-treated**
- **Not a basic issue item**
- **Can be special ordered from DSCP**
- **Treatment effective for life of uniform**

MECHANICAL MODIFICATIONS

- **Clear away leaf litter and underbrush**
  - **Raking**
  - **Mowing**
  - **Controlled burning**

- **Drain standing water**

- **Prevent water accumulation in containers or depressions in the ground**

SANITATION

- **Each individual must participate in overall unit sanitation effort**

- **Maintain garbage and other odiferous decaying matter in tightly closed containers, or bury, burn or remove it**

PESTICIDE TREATMENT OF THE ENVIRONMENT

- **Should only be attempted when other protective and preventive measures are, or will not be, fully successful**

- **Should only be performed by trained or certified individuals**

- **DoD environmental policy stresses reduction of pesticide use**

INEFFECTIVE / HAZARDOUS PRACTICES

X **Use of products that:**

- **are not EPA-approved for personal protection**
  (e.g., animal flea and tick collars)
- **contain too little repellent to be effective in a field setting (e.g., 10% DEET)**
- **contain chemicals that don't protect as well as DEET (e.g., citronella)**
- **are folk remedies (e.g., match heads,vitamins, bath oil, etc.)**

X **Not following label instructions**

DO NOT USE THE FOLLOWING PRODUCTS FOR PERSONAL PROTECTION:

X **Animal flea and tick collars - Contain pesticides**
that can damage skin and/or poison humans

X **Non-DEET Products - Much less effective than military and other DEET repellents in field settings**

SUMMARY

Conscientious use of the DOD INSECT REPELLENT SYSTEM, and other personal protective techniques, provides maximum, safe protection from arthropod attack

F APPENDIX - GLOSSARY

AFMIC- Armed Forces Medical Intelligence Center

AFPMB- Armed Forces Pest Management Board

cm- centimeter

CFC- chlorofluorocarbon

DEET- N,N-diethyl-m-toluamide, or N,N-diethyl-3-methylbenzamide

DSCR- Defense Supply Center of Richmond

DNBI- disease and non-battle injuries

DoD- Department of Defense

DOT- Department of Transportation

DPMIAC- Defense Pest Management Information Analysis Center

DVEP- disease vector ecology profile

EC- emulsifiable concentrate

ESOC- Emergency Supply Operations Center

FORSCOM- U.S. Army Forces Command

IDA- individual dynamic absorption

mg- milligram

ml- milliliter

NSN- national stock number

Permethrin- (3-phenoxyphenyl) methyl (+/-) cis/trans 3-(2,2-dichloroethenyl) 2,2-dimethyl-cyclopropanecarboxylate

psi- pounds per square inch

PVNTMED- preventive medicine

TG- Technical Guide (USACHPPM publication)

TIM- Technical Information Memorandum (AFPMB publication)

USACHPPM- U.S. Army Center for Health Promotion and Preventive Medicine

USAEHA- U.S. Army Environmental Hygiene Agency

USAMEDDAC- U.S. Army Medical Department Activity (a hospital)

VECTRAP- vector risk assessment profile

WRAMC- Walter Reed Army Medical Center